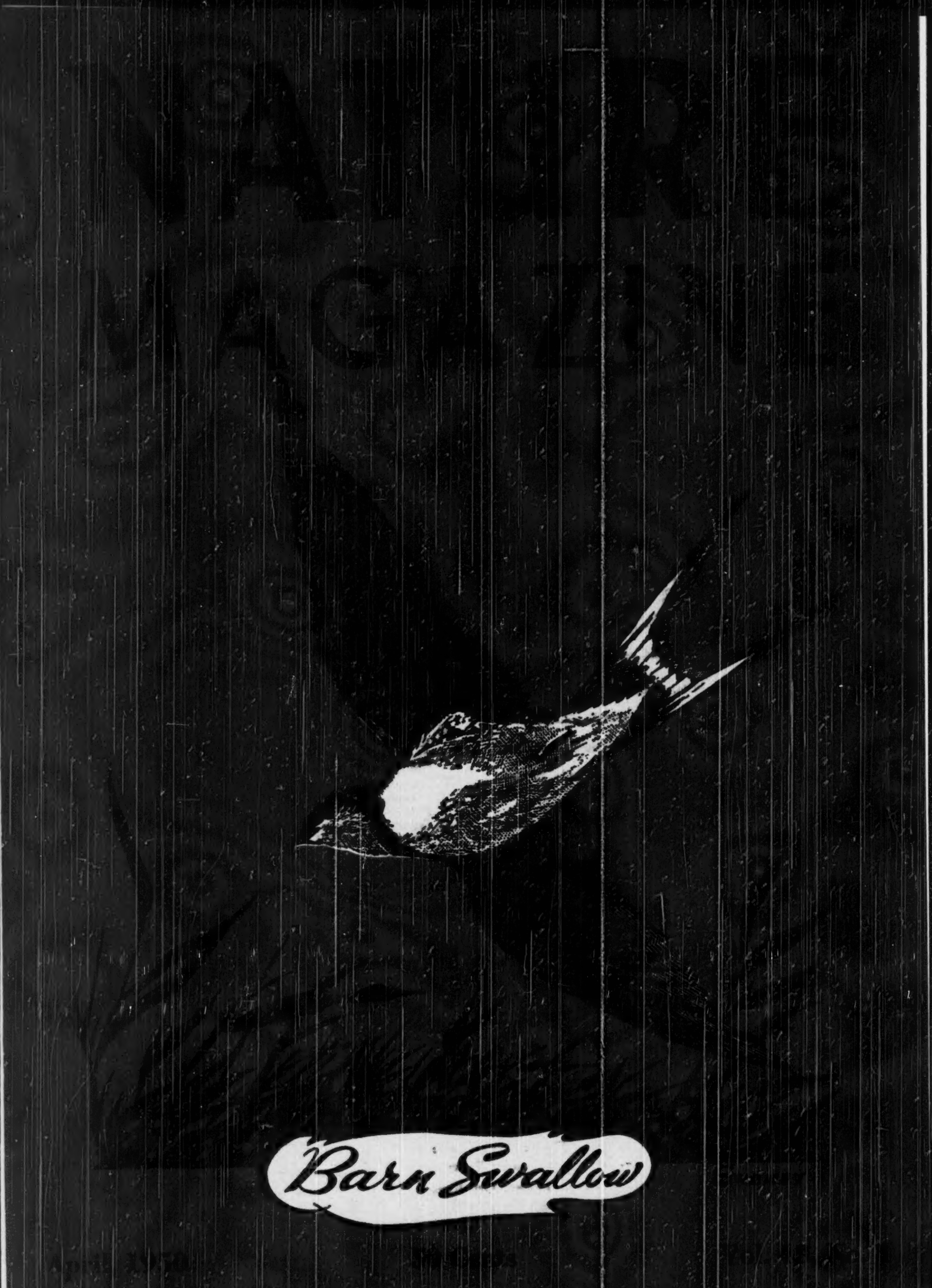
Barn Swallow

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Along the Muir Trail

Joseph C. Wampler, archeologist and mountaineer of 1940 Hearst Avenue, Berkeley 9, California, announces two trail trips — walking or riding — along the John Muir Trail in the High Sierra. The first trip leaves Whitney Portal on July 16 and reaches Tuolumne Meadow on August 11. The second leaves the Meadow for the Portal on August 13, arriving there four weeks later. Pack animals will carry equipment. The total distance is about 200 miles, so a schedule of an average of fifty miles a week allows plenty of leeway for layovers, side jaunts and relaxation. Full details may be obtained from Mr. Wampler, who has organized the trips on the urging of several members of the Sierra Club.

Smith Redwood Grove

In 1826 Jedediah Smith was the first pioneer and explorer to enter California by the overland route. Two years later he discovered the Smith River in northwestern California among the redwoods. It is particularly appropriate, therefore, that the Save-the-Redwoods League should name a newly established grove of the great trees The Jedediah Smith Memorial Grove. This grove was made possible through gift from Mr. and Mrs. C. M. Goethe of Sacramento, matched in equal amount by the State of California. The grove is a prominent feature of the Smith River-Mill Creek State Park.

Forest Report

More than 40 years of Forest Service research, which has resulted in saving millions of dollars for private industry and in the better management and use of forest resources, is traced in the annual report of Lyle F. Watts Chief of the Forest Service, U. S. Department of Agriculture.

In the report, addressed to Secretary of Agriculture Charles F. Brannan, Mr. Watts declares that public and private foresters are learning through organized research how to increase forest productivity and achieve more effective conservation. He sees tremendous possibilities for research work in the future.

All over the nation, Forest Service research is leading to wiser management of our forest resources.

Moose Increase

About 19,000 moose are to be found in eight or nine northern States, an increase of about 7000 in five years, according to a new wildlife pamphlet, *The Moose and Its Ecology*, by Dr. N. W. Hosley of the U. S. Fish and Wildlife Service. Dr. Hosley emphasizes that particular care should be exercised in moose management, and that a "great deal more has to be learned" about these animals. The pamphlet is free on request to the Division of Information, U. S. Fish and Wildlife Service, Washington 5, D. C.

Nature in Print

By HOWARD ZAHNISER

One fine day last April I had just enough time between trains in Los Angeles to stroll a few blocks away from the railroad station and seek out a secondhand bookstore where I found (for fifty cents) a dark blue book entitled (in gold) *The Outlook to Nature*. It was written by Liberty Hyde Bailey when this century was yet young, copyright first in 1905, although my "new and revised edition" was dated 1911. Yet it struck me as amazingly similar in many respects to Joseph Wood Krutch's most excellent new book *The Twelve Seasons*, which I had just been reviewing.

"I preach the things that we ourselves did not make," declared Dr. Bailey. "I preach the near-at-hand, however plain and ordinary, — the cloud and the sunshine; the green pastures; the bird on its nest and the nest on its bough; the rough bark of trees; the frost on bare thin twigs; the mouse skittering to its burrow; the insect seeking its crevice; the smell of the ground; the sweet wind; the silent stars; the leaf that clings to its twig or that falls when its work is done."

This was a wholesome gospel, it seemed to me, and — traveling as I was on a mission for the preservation of wilderness areas — it was good assurance to read Professor Bailey's comment that "perhaps our greatest specific need is a wholesome return to nature in our moments of leisure." It was edifying to consider his further advice: "This return to nature is by no means a cure-all for the ills of civilization, but it is one of the means of restoring the proper balance and proportion in our lives."

Here was a prophet worth heeding, and I have since been rereading and pondering *The Outlook to Nature* and another (and I think, greater) book by Liberty Hyde Bailey, published in 1915, *The Holy Earth*, together with this unusual new book entitled *Liberty Hyde Bailey: A Story of American Plant Sciences* written by Andrew Denny Rodgers III.

This work by Mr. Rodgers is the fifth in a series of biographical-historical volumes that deal with botany and the plant sciences in America, each of which it has been my pleasure to read and to call to the attention of the readers of this page. William Starling Sullivant, the pioneer American student of mosses and liverworts, was Mr. Rodgers's grandfather. Thus it happened that Mr. Rodgers, who was educated in the law and practiced his legal profession for a number of years, turned his attention a decade or so ago to a chronicle of the life of his bryologist grandfather. This was published in 1940 by G. P. Putnam's Sons with the title "*Noble Fellow:*" *William Starling Sullivant*. Mr. Rodgers fortunately was thereupon encouraged to continue his interest in the history of botany, and we have since been favored with a series of volumes published by the Princeton University Press, beginning in 1942 with *John Torrey: A Story of North American Botany*. There followed in 1944 *John Merle Coulter: Missionary in Science* and in the same year *American Botany: 1873-1892: Decades of Transition*, of which Asa Gray was the chief figure. Now we have *Liberty Hyde Bailey: A Story of American Plant Sciences*. And, as each of the preceding volumes has evidenced Mr. Rodgers's increasing interest in a new protagonist for his historical series, so also this work leads us to anticipate a further book in which, it appears, Bernhard E. Fernow will be the principal figure, and forestry the subject of interest.

These volumes are unique. Mr. Rodgers is intensely interested in the history of botany and its related sciences. He also is intensely interested in the lives of the heroes of these sciences. His interests are personal and of the sort that we all call human. The results are these volumes of essays in the history of a science that at the same time give us details in the lives of the scientists.

"The writing of a history of American science," Mr. Rodgers observes in one of his prefaces, "must proceed by contributions," and he has indeed made a notable one, both for the historians and biographers who may come after him and for the lay readers who like himself take delight in the collection of such materials and the telling of these life stories. I for one hope that he will long continue his great project, and as I perceive now his botanical interest leading him into forestry's history and his research into Liberty Hyde Bailey's writings leading him into this man's basic writings on the appreciation of Nature, I find myself anticipating Mr. Rodgers's further excursions into the history of the conservation of natural resources and the preservation of wildlife and wild areas for their recreational, spiritual, and scientific interest to man.

This most recent volume is to me the most interesting of all, and I would judge it to be the best, at least the best since Mr. Rodgers's first book, on his grandfather. I miss in this new book a preface, which Mr. Rodgers has used in the past to comment himself on his undertaking, and I miss the bibliography which I feel the volume sorely lacks. A chronology is another appendix that would be helpful. Yet I feel that, more successfully than in any other of his botanical histories, he has been able to relate his entire volume to one man, telling in some detail of various scientists but achieving a unity through his central personality.

The most outstanding fact of all, however, is that this personality is that of Liberty Hyde Bailey — a most remarkable man, indeed. Born on March 15, 1858, he is part of our great history in plant science, in agricultural extension work, in rural planning, in conservation, in Nature appreciation, in gardening — author of some 40 works besides the three great cyclopedias he has edited, including the famous Bailey's *Standard Cyclopedia of Horticulture*. Away back in 1908 he was the first president of the American Nature Study Society — "an honor issuing," as Mr. Rodgers says, "from his participation in this great work." Yet he is today one of our great plant explorers and, but for the fact that during the recent Christmas-week meetings of the American Association for the Advancement of Science in New York City he fell and fractured a hip, would now be in Africa, in Nigeria, pursuing the study of palms, which in recent years has engrossed his attention. The curious and remarkable anecdotes of Liberty Hyde Bailey's experiences are throughout Mr. Rodgers's book and in the newspapers that have been published since it was issued. It is no wonder that this is an interesting book.

Yet I must not indulge further in relating these interesting features of Mr. Rodgers's subject, which are indeed to be enjoyed in his book, for I do wish to represent what seems to me to be a great and possibly somewhat hidden value in this book. It pervades a chapter that is derived mainly from Liberty

Natural Economics

By CATEAU DE LEEUW

There is a thrift in Nature, which is found
In valley beds to hold the rain that falls;
In silent aisles of gothic forest halls
Where leaves and needles line the plushy ground;
In ancient wells where once was heard the sound
Of beating seas, the salt lick mutely calls
The slim, shy deer; in long-cooled lava walls
Which keep the greening land from surfs that pound.

There is a thrift, but there's decision, too,
For when the balance of her ordered law
Tilts downward, Nature can read out a doom,
Can cast aside a failure, calmly spew
The misfits from her great impartial maw
To give to some new project life and room.

Hyde Bailey's book called *The Holy Earth* — the value of what Mr. Rodgers calls a "ripened and seasoned philosophy," expressed in this book, which he most rightly describes as "of enduring worth." So impressed has Mr. Rodgers been by *The Holy Earth*, and apparently so humble before it, that he has quoted at great length — at such length, indeed, that nearly all the more striking parts of the book *The Holy Earth*, which, on reading and rereading, I have noted, in the book itself, are included in this chapter of Mr. Rodgers's work. I would that some publisher of books widely distributed might reprint *The Holy Earth* and display it in ten thousand corner stores.

"To feel that one is a useful and cooperating part in nature is to give one kinship," says this gospel, "and to open the mind to the great resources and the high enthusiasms." And again: "To live in sincere relations with the company of created things and with conscious regard for the support of all men now and yet to come, must be of the essence of righteousness."

"The sacredness to us of the earth," thought Liberty Hyde Bailey, "is intrinsic and inherent." Although, as he had perceived, "we have assumed that there is no obligation to an inanimate thing, as we consider the earth to be," nevertheless he insisted that "man should respect the conditions in which he is placed." Thus Dr. Bailey preached conservation and, seer that he was, cried out for "a more wide-spread contact with the earth on the part of all the people."

With the poignancy of our great modern fallacy most surely deep in his consciousness, he prophesied: "We miss our destiny when we miss or forget our backgrounds."

The backgrounds, he wrote in a paragraph of *The Holy Earth* that must be the conclusion of our sampling of Mr. Rodgers's book—

"The backgrounds are the great unoccupied spaces. They are the large environments in which we live but which we do not make. The backgrounds are the sky with its limitless reaches; the silences of the sea; the tundra in pallid arctic nights; the deserts with their prismatic colors; the shores that gird the planet; the vast mountains that are beyond reach; the winds, which are the universal voice in nature; the sacredness of the night; the elemental simplicity of the open fields; and the solitude of the forest. These are the facts and situations that stand at our backs, to which we adjust our civilization, and by which we measure ourselves."

Liberty Hyde Bailey: A Story of American Plant Sciences. By Andrew Denny Rodgers III. Princeton, N. J.: Princeton University Press. 1949. 506 pp. (6¼ by 9¼ in.). with frontispiece portrait and 10 other photographs on 5 plates, and index. $7.50.

Outdoor Stories

My Favorite Stories of the Great Outdoors. Selected by Roy Chapman Andrews. New York. 1950. The Greystone Press. 404 pages. $2.98.

Explorer, naturalist and author, Roy Chapman Andrews knows many of the far corners of the earth. It is natural, therefore, that in selecting an anthology of his favorite stories of the outdoors he should cover a wide geographic range as well as a broad subject range. His enthusiasm for the stories thus selected will be shared by many readers.

Evolution's Future

The Future of Evolution. By Junius T. Hanchett. Antrim, N. H. 1950. The Whiton Book Company. 185 pages. $2.00.

The author of this book has meditated on the subject of evolution for a long time, and first gave form to his theories in 1907, when he wrote two essays. To attempt a definitive review of Mr. Hanchett's ideas within the space available would be impossible. We must content ourselves with saying that anyone who may like to think about evolution will find this book interesting and stimulating. The author has a well-developed sense of humor, which makes his development of his theories entertaining.

North Central Animals

Taxonomic Keys to the Common Animals of the North Central States. By Samuel Eddy and A. C. Hodson. Minneapolis. 1950. Burgess Publishing Company. 123 pages. Illustrated. $2.00.

This is a revised edition of a key that covers the identification of the common animals of the upper Mississippi Valley and the Great Lakes regions. It does not include the parasitic worms, insects and birds. This book is designed for use in classes in field biology and ecology and as a general reference for all biologists.

More Golden Books

Golden Books in various sizes seem to pour in a rather steady stream from the presses of Simon and Schuster. The latest to come to hand include *Funny Bunny* in the Big Golden Book series, at one dollar. This is the work of Rachel Learnard, with illustrations by Alice and Martin Provensen. A sextet of titles are added to the Little Golden Book series, being *Baby's House*, by Gelolo McHugh, with illustrations by Mary Blair; *The Big Brown Bear*, by Georges Duplaix, with illustrations by Gustaf Tenggren; *The Color Kittens*, by Margaret Wise Brown, with illustrations by Alice and Martin Provensen; *Duck and His Friends*, by K. and B. Jackson, with illustrations by Richard Scarry; *The Happy Man and His Dump Truck*, by Miryam, with illustrations by Tobor Gergely; *The Little Trapper*, by Katheryn and Byron Jackson, with illustrations by Gustaf Tenggren. The price of each of these is twenty-five cents.

NATURE MAGAZINE

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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

IN THIS ISSUE

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Mourning Dove Champion

Probably the most ardent friend of the mourning dove is Guy Atherton of St. Paul. A man of most modest means, he has felt so strongly about the slaughter of this beautiful and valuable bird that he has sacrificed in order to do what he can in its behalf. He fought the fight that got the bird on the protected list in Minnesota, and his factual material has contributed to its protection elsewhere. Now Mr. Atherton feels that Illinois is a pivotal State and has turned his attention there. As chairman of the legislation committee of the St. Paul Audubon Society he has gotten out a newssheet for distribution to the press and interested people throughout Illinois and needs support to follow this up. To provide him with the weapons, the Society has set up a conservation fund and invites contributions to it to aid the fight for the mourning dove. A release from Mr. Atherton says that any contributions should be sent to Marvin Adams, Treasurer, St. Paul Audubon Society, 239 Mackubin St., St. Paul, Minnesota, marked "For Conservation Fund." Also ask for a copy of the informative mourning dove newssheet.

McKenny Slides

Margaret McKenny is the author of several well-known Nature books, including an excellent mushroom guide. In the course of her field work she has built up a considerable collection of colored slides, including perhaps the largest collection of slides of mushroom pictures in the country — more than two hundred. Recently Miss McKenny has been able to set up a duplicating-box to make copies of her slides available to people interested in mycology, and to biology departments. In addition, Miss McKenny has made up sets of slides of flowers and scenes in western Washington; eastern Washington; Mount Rainier; Olympic National Park; Oregon, and of the flowers of desert and canyon in California. These are Kodachromes in cardboard readymounts numbered to correspond with accompanying lists. Full details about all these may be obtained from Margaret McKenny, 2201½ S. Water Street, Olympia, Washington.

Invertebrates

Selected Invertebrate Types. Edited by Frank A. Brown, Jr. New York. 1950. John Wiley and Sons. 597 pages. Illustrated. $6.00.

This is a joint work of a group of thirteen zoologists, most of them members of the Department of Invertebrate Zoology, Marine Biological Laboratory, Woods Hole, Massachusetts. The book is primarily a laboratory manual, but it also introduces investigators to species that they can use in their own experimental investigations.

Salt-Water Fishing

Salt-Water Fishing. By Robert A. Dahne. New York. 1950. Henry Holt and Company. 342 pages with illustrations by Elena K. Mead. $5.00.

This is a complete guide to salt-water fishes and how to catch them. It covers both coasts and the Gulf coast. The first two sections cover the game fishes and the sport fishes; the third, bait; fourth, methods; fifth, tackle. The book appears to answer all the questions a salt-water fisherman might ask.

For a Fair Deal

"A Fair Deal for Our Birds of Prey," the excellent article by Richard Stuart Phillips, originally published in *Audubon Magazine*, has been made into a valuable pamphlet that effectively tells the story of the situation in which our hawks, eagles and owls find themselves. A lot of factual data is concentrated in one place, here, and copies of the pamphlet are available for five cents. A special price of three cents a copy is made when more than 100 copies are ordered. The reprint may be obtained from the National Audubon Society, 1000 Fifth Avenue, New York 28, N. Y.

Contents Noted

CONTROL of the pollution of our streams is of vital importance to all, and any proposal that seems to make a sound contribution to the solution of that problem is worthy of the most careful consideration. Such a proposal is contained in a bill before the Congress, introduced by Congressman Byrnes of Wisconsin, and numbered H.R. 5089. Under the bill owners of industrial plants discharging wastes into streams would be given incentive to establish treatment plants by being allowed to amortize the original cost of installation for income-tax purposes. Smaller firms, particularly, often find it impossible to take on the burden of a treatment plant, even though, once installed, it usually results in a by-product of financial value. Steps have already been taken to aid needy communities to install sewage plants, and larger industries are beginning to undertake treatment plants for the conversion of wastes. A vast job, however, remains to be done and unless the bad conditions in our streams are soon remedied by voluntary control, mandatory legislation must be adopted. Mr. Byrnes proposed law seems, therefore, a definite step in the right direction.

FROM the U.S. Fish and Wildlife Service came two releases on the same day. They might well have been issued as one release and thus drive home the interrelationships that exist in Nature. One release bore the headline: "Ducks Go Hungry Where Carp Are Present in Large Numbers," and the other "Cormorants in Midwest Eat Quantities of Carp, Studies Show." Being a vegetable-eater, the carp was found to find tasty the same plant foods that ducks like for their diet. Where the carp were numerous they wiped out most of the duck food and otherwise upset food conditions. Other studies proved that cormorants in some mid-Western areas eat carp to the extent that these fishes make up ninety-five percent of their diet. The birds had been falsely accused of eating trout, salmon and other game fish. As a matter of fact, the cormorants usually cannot catch these fishes. From these studies, however, it would appear that ducks, carp and cormorants could get along nicely together and establish a fine Nature balance.

ANOTHER release from the Fish and Wildlife Service reports that, during the past nine years, ninety-six mountain goats have been live-trapped in Montana for transfer to and restocking of old game ranges in the State. Twenty-five goats were trapped in 1949, in a Pittman-Robertson project. Six of these, old billies, were released; six others died from the unseasonable heat and from fright. The remaining thirteen were successfully transplanted. The release says: "The captured goats were rendered harmless to each other and to their handlers by having a short piece of garden hose looped and cemented over their two stiletto-sharp horns. The goats were then blindfolded and their feet tied for transportation out of the mountains seven miles on the river in a rubber boat — shooting the rapids enroute. Once out of the mountains, the goats were loaded in a Stinson plane and flown to the new range area. There, the goats were packed into the mountains on horses." It certainly sounds like a lot of effort to provide a few targets for Montana gunners. And there is no mention in the release of whether or not the area in which the goats are restocked is closed to hunting so that the animals may have a chance to establish themselves there, assuming they recover from the rigors of the transfer itself.

WE ARE not alone, it appears, in our constant problem of protecting parks and other areas from exploitation. An appeal for help comes from Italy, and from the friends of the National Park of the Grand Paradise in northern Italy. That area was set aside to protect the flora and fauna in it. It is the home of chamois, marmot, hare, fox, eagle, partridge, pheasant, martin and the unique Alpine ibex. Indeed, the whole park is worthy of the adjective unique. Now there is a proposal to exploit the waters flowing from the glaciers in the Grand Paradise by building a huge dam that would ruin this area. Already the Aosta Valley is fully exploited for hydro-electric purposes and supplies the industrial cities of northern Italy. From Professor Guido Tercinod of Aosta comes this appeal for help in saving this area "because we feel that the life of the Grand Paradise Park is a matter that soars beyond our frontiers, a matter which concerns everyone's science and culture, and this appeal should find an echo in all men who stand for the protection of Nature." Any help, "either by writing or by words, is useful," Professor Tercinod says. Here are our words — save Grand Paradise before it is too late.

ATTENDING the hearing on H.R.5507 and 5629, identical bills proposing to extend protection to our national emblem, the bald eagle, in Alaska, we were gratified to discover the almost unanimous sentiment in favor of the bill. The Fish and Wildlife Service was neutral, but Dr. Clarence Cottam, assistant chief, presented biological data all favorable to the bird. We were especially pleased to discover that Delegate Bartlett of Alaska presented an open mind on the subject, despite the uninformed prejudice that still prevails in parts of Alaska against the bald eagle. Declining generally throughout the United States, our national bird may make its last stand in the Territory now actively seeking to become the 49th State. Totally aside from any sentimental argument in favor of extending protection of the eagle, the facts are that the bird affects man's interests in a most minor degree, even though it has been made a scapegoat for some of man's own errors.

R.W.W.

"Roderick slipped out of his hammock and got a small hand net from the kit. He returned with it to his hammock."

The Mystery of the Vampire Bat

By WILLARD PRICE

Illustrated by Jacob Bates Abbott

ENCAMPED on the bank of the Amazon, we were favored one night by a visit from vampire bats. The whole air above our hammocks, suspended between trees, pulsated with the beat of wings.

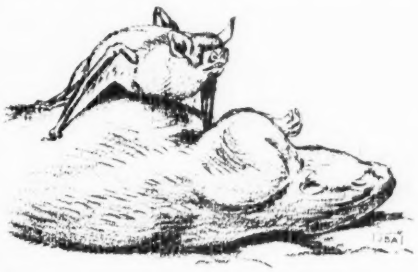
Roderick Campbell, animal collector, considered it a great opportunity to learn something about this extraordinary and little known creature. He and his brother, Jack, were collecting animals for North American and European zoos and menageries. Roderick hardly hoped to take home a vampire bat, for it does not thrive in captivity, but he wished to study it in its natural state. I was accompanying his party temporarily as an observer for an interested museum, and as a journalist.

Roderick slipped out of his hammock and got a small hand net from the kit. He returned with it to his hammock.

"Now I'm going to set a trap for them," he said.

"What will you use for bait?"

"Me," laughed Roderick, a little uneasily. "If William Beebe could do it, I can."



The vampire attacks many animals, which die from the loss of blood rather than the bite.

Naturalist William Beebe had deliberately exposed his arm and waited for a vampire to bite him. The creature landed lightly and began to make an opening. Beebe's imagination played tricks with him and he thought he felt blood flowing. He tried to seize the bat, but it eluded him. Examining the arm, he found that he had interrupted the bat too soon. Only a slight scratch had been made and there was no blood.

"But I'm going to stick it out, no matter how it feels," Roderick said.

The methods of the vampire bat had always been a dark mystery, which was only then beginning to be cleared up by such men as Ditmars and Beebe. The creature had always been called a "blood-sucking bat." Ditmars had contended that it does not suck blood, but laps it up as a cat laps milk. There had been legends that the bat fans its victims to sleep with its wings. Others had it that the bat hovers over the body instead of alighting when it bites.

Roderick would find out whether these stories were true. He stretched out his bare arm and lay still. For a long time nothing happened. Then the beat of wings seemed to come closer. Finally he felt a very light pressure on his chest, as if a bat had landed there. It was as light as a breath, and if he had been asleep he would never have noticed it, and would not have awakened.

There was no sensation for a while. He could hardly bear the suspense. He wanted to leap up and beat the air to drive away the creature that wheeled around him.

Then he was aware of a slight tickling on his wrist. That was the only sign that a landing had been made there. He was not even sure that he felt it.

But the tickling now seemed to be going up his arm to the elbow. Or it might be just the night breeze blowing over his arm — he could not tell.

For a while there was nothing. Then his arm near the elbow had a slight tingling sensation as if it were going to sleep. This discovery excited Roderick greatly. Scientists had often speculated as to how a bat could puncture the skin without the victim feeling it. It was believed possible that the bat's saliva contained a local anesthetic, which numbed the spot where the bite was to be made. What Roderick felt seemed to bear out this idea.

Like Beebe, Roderick imagined that the hole was cut and the blood was flowing. He resolutely lay still. There was one thing sure — the actual cutting of the hole could not be felt, or the lapping up of the blood. Or else the bat had flown away — he could not tell.

Perhaps he was just fancying the whole thing. But no — now he could really feel something — the very faint sensation of warm blood flowing down over the part of the arm that had not been drugged.

He felt he had learned enough for one lesson. He must capture the little blood-drinker before it satisfied itself and flew away. With all the force at his command he swung the net across his body and down upon his elbow — then twisted the handle smartly so that anything caught in the net could not escape.

He reached for his flashlight. Yes, he had not been just imagining things. His arm was a gory sight. He did not bother with it but looked at the net. A devilish-looking creature struggled in its meshes.

"I've got it!" he yelled. "I've got it! Look!"

An extraordinary face leered out of the net. I thought I had never seen a face more evil.

The old legend that had given birth to the name of this creature came back to my mind. "Vampires" were supposed to be ghosts that came out of their graves at

night to suck the blood of human beings. This superstition had been the basis of that terrible play, *Dracula*.

Certainly this bat embodied all the horror of the old legend. It was a thing of the night, dark, sinister, with beady eyes full of hate peering out through overhanging fur. The ears were pointed like those generally pictured on Satan himself. The nose was flat and the under jaw projected like a prizefighter's.

"Looks like a cross between the devil and a bulldog," I whispered, for the face seemed too dreadful to be spoken of aloud.

But we were yet to see the worst. The bat opened its mouth in a vicious snarl. The long nimble tongue, with which it had been lapping up its dinner, was covered with blood. The beast seemed short on teeth, but those it had were terribly efficient. There were two long canines, one on each side.

But the really amazing teeth, the ones that had given the vampire its fabulous reputation, were in the front of the upper jaw. They were twin incisors, slightly curved and as sharp as needles. It was with these lances that the bat made its deep but painless incisions.

Besides blood, there was a sort of watery mucus in the mouth. If Roderick ever got this bat to a laboratory he would have that secretion analyzed to see if it contained any narcotic agent that puts the flesh to sleep, or anything that prevents blood from clotting.

The blood was still running from the wound. We stanched it by tying a handkerchief tightly around the arm.

That was what often caused death, especially to small animals — not the bite of the vampire, but the continued flow of blood after the bat had finished feeding. Blood ordinarily clots in a short time. Did the saliva of the bat contain a chemical that prevented clotting?

The bat beat its wings but the net was strong. While no stories could have overstated the ugliness of this creature, its size had been exaggerated. It had been confused with the great fruit bat, which may measure two or three feet between wing tips. The span of this bat was only twelve inches and its body was about four inches long.

"Little, but oh my!" came from Jack. He had a distressing thought. "If you plan to keep it a while for study, how are we going to feed it?"

"I was wondering about that," I admitted. "It has to have about half a cup of fresh blood every day."

Roderick turned his gaze upon Jack. "You'll have to go foraging and get one warm-blooded animal per day for Vamp."

Vamp spent the rest of the night in the net. In the morning, she — for in spite of her lack of feminine beauty she was identified as a member of the fair sex — was transferred to a cage that Roderick made from strips of bamboo.

And we had time to turn to our manuals. It was interesting to compare our experience with those of great naturalists of the past. Darwin was the first European naturalist to capture a vampire in the act of feeding on an animal. He wrote:

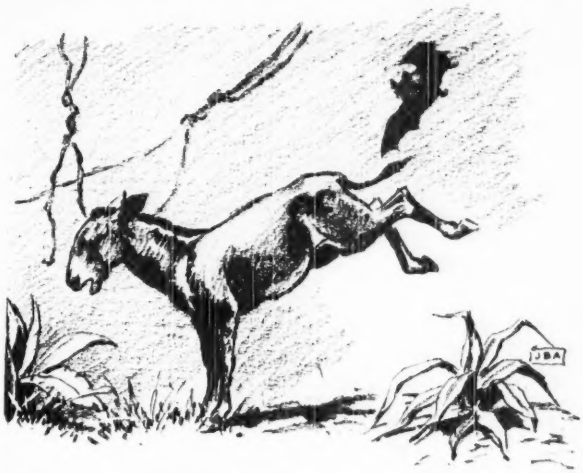
"The whole circumstance has lately been doubted in England; I was therefore fortunate in being present when one was actually caught on a horse's back. We were bivouacked late one evening near Coquimbo, in Chile, when my servant, noticing that one of the horses was very restive, went to see what was the matter, and fancying he could distinguish something, suddenly put his hand on the beast's withers, and secured the vampire. In the morning the spot where the bite had been inflicted was easily distinguished from being slightly swollen and bloody."

Crossing the Bolivian highlands, Miller reached a small village where vampires swarmed. He tried to protect his mules by wrapping them in canvas sheets, but to no avail. Bitten on the face or the legs, the mules rolled on the ground and loosened their covers. The bats did not easily take fright. When Miller grabbed for one of them, it would fly to the opposite side of the mule and start drilling again. After three days the mules were so near collapse that they had to be driven to another town, free from infestation.

In some regions it is almost impossible to

In order to provide Vamp with food a capybara, an Amazonian rodent, was captured for her.

The explorer Miller, when crossing the Bolivian highlands, nearly lost his mules to a concentration of bats.



raise chickens, cattle, sheep, goats, mules, pigs, dogs or horses because of the vampires. They attack man readily, if his chemical composition pleases them. Some persons are constantly tormented, while others are never touched.

How the perfect little cone-like hole was made was for a long time a complete puzzle. Gardner thought the skin was punctured "by the sharp hook nail of its thumb and that from the wound thus made, it abstracted the blood by the suctorial powers of its lips and tongue." Wallace had several theories — his first was closest to the truth: "It can hardly be a bite, as that would awake the sleeper; it seems most probable that it is either a succession of gentle scratches with the sharp edge of the teeth, gradually wearing away the skin, or a triturating with the point of the tongue, till the same effect is produced. My brother was frequently bitten by them, and his opinion was that the bat applied one of its long canine teeth to the part, and then flew round and round on that as a center, till the tooth, acting as an awl, bored a small hole; the wings of the bat serving at the same time to fan the patient into a deeper slumber."

But we had confirmed the finding of later scientists that the bat does not perform the difficult feat of biting while on the wing, but lands, very lightly, and cuts a hole with its surgically sharp incisors.

A lighted lamp discourages vampires, and, so far as the Indian is concerned, "if it comes to a question of no bread or no light, he is quite likely to invest his last money to maintain the light." However, a bat, disliking a light, may choose to put it out. The naturalist Bates had his lamp extinguished repeatedly by vampires. Our Indians reported the same experience.

Why does the victim experience no pain when bitten? Ditmars is inclined to think that there may be a local anesthetic in the bat's saliva. All he can say definitely is that "something abnormal has happened to the tissue besides that of the opening of a mere wound by specializing and lancing incisor teeth." Could the same substance be both a local anesthetic and an anti-coagulant? The fibrinogen in blood usually causes it to clot quickly. But a vampire-bitten opening flows on and on for hours, sometimes seriously weakening the victim.

But the vampire has a still more serious talent — it can transmit deadly diseases. The Gorgas Memorial Laboratory in Panama finds that hundreds of horses and mules of the Canal Zone die because of a trypanosome transferred to them from diseased cattle by vampire bats. Both cattle and human beings on the island of Trinidad die of paralytic rabies, which, it is now believed, is transmitted by the vampire.

Jack, commissioned to find food for Vamp, came in with a capybara, an Amazon rodent. Breakfast was served to the bat inside her cage, which was shrouded in cloth in order to make it as dark as the caverns that had been her home during daylight hours. After a time we peeked in, but the cautious Vamp was still hanging upside down to the top of her cage.

We had our own breakfast. Then we took another look. The bat was poised like a great spider over the rodent and was feeding greedily, but, disturbed by the light, immediately retreated again to the top of the cage.

In that flash, we had seen enough. It was true. The vampire was not a blood sucker as most scientists supposed it to be. Its mouth had not touched the wound. We had plainly seen its long, bluish-pink tongue darting out and in at the rate of about four times a second. The movement was so rapid that a continuous column of fluid spanned the gap from wound to mouth. It was the technique of cat or dog, but at high speed.

And to think that this operation could be carried on so gently that a sleeping victim was not wakened, and one wide awake scarcely knew what was going on!

Although Vamp served her purpose as an object of study, she did not help Roderick to pay the expenses of his trip. In two weeks she began to languish, and in three weeks he freed her rather than see her die. The world's zoos are still in the market for a live and thriving vampire bat, seemingly impossible to keep captive.

Morning

By EDWARD D. GARNER

If you have heard the lark's clear morning song,
Filling dawn's chalice to the very brim,
You have heard in measures, wonderful and strong,
The voice of beauty, with a word from Him.

April Concerto

By OSCAR OSTLUND

Morning

MUSICAL tones that hover high in the jackpine woods, volatile as the mist that veils the identity of warblers in the tree tops — this is Springtime's music on the Mountain early in the morning.

The mixed ensemble of song birds cannot be seen; only the wisps of vapor to which their voices are conjoined. The notes of their song are as droplets of dew afloat on the wind, sprinkling down from the sky.

April's music is contoured by winged motion; its dulcet organ tones are tempered in the fog.

Midday

THE increasing light as day advances finds harmonic impact in the cardinal's song. From his perch among the alders near the river, he articulates the joy of living in the sunniest hour of the day. Plumed in a flamboyant crest of warm, rich red, the cardinal sounds the keynote of the reveille by which Nature summons all things on the earth to Spring's awakening.

The quickening tempo in the dance of life; the eventfulness; the enthusiasm; the insuppressible expectation speaks out through the virile accent, the rippling cadence of the cardinal's song The music that bursts from his throat is at one with the sun's increasing warmth; the visible quiver of heat waves over the field; the rapture of blue in the sky.

Evening

THE peeper's notes are attuned to the pulsation of starlight in the moist April sky. The brilliance of light from a billion stars is answered by its visible image, and by a vocal brilliance, in the lowly water.

"Peep . . . Pee-eep? Peep-peep? These voices through aeons of Springtimes have been heard on the marsh. In the aweful span of Nature's auditorium, they are among the oldest sounds produced by vocal chords. But listen to the peepers, on this current April night, still singing in their absolutely youthful pitch; of innocence, of wonderment, of curiosity.

They hold their concert in a theater of contrasts where the spokes of high ridges converge on a low-lying hub of land that lies within a sweeping horseshoe of the Juniata River. On this stage, where the mountains come together, there is a consonant union between dissimilar things. The brackish water holds the image of dynamic stars. Laid low upon the earth, the withered remains of last year's plant life, exhales the fragrance of health in its consummate bloom.

In this theater at Eastertime, where things perceived-as-opposites complement each other — Nature, undisturbed by the transient show of death, affirms its faith in life through these upwelling youthful tones that dance in a skipping rhythm over the marsh.

★

Gossamer Lady of the Washes

By EVALYN SLACK GIST

THE smoke tree, *Parosela spinosa*, is one of the most unusual of desert shrubs because of its gossamer-like appearance and strange choice of habitat. Those who see one for the first time, in the early morning sunlight, are struck by its evanescent quality. Spiny, almost leafless, this gray-green lady of the desert often attains the dignity of a tree. Almost wholly confined to washes, it may be found on the southern Mojave, Colorado, Lower California and Sonora deserts. During June the trees are at their best. Then, loosely branched clusters of tiny, bluish-violet flowerettes adorn every twig, looking like nothing so much as soft puffs of smoke. The seeds sprout readily after a summer cloud-burst followed by hot sunny days. Oddly enough, these same cloudbursts are largely responsible for high mortality among young plants, since water rolling down the washes tends to cover them with sand. Seedling plants differ from the mother tree in that they have broad, well-formed leaves in place of spines. Generally short-lived because of infrequent rains, growing trees are protected by law. Their lacy branches and delicate coloring place them in a wasteland decorative class.

PHOTOGRAPH BY M. B. GIST

A desert smoke tree, decorative plant of the washes, near Palm Springs, California.

Chestnut on the Come-Back Trail

By ANDREW S. WING

Under the spreading chestnut tree, the village smithy stands;
The smith a mighty man is he, with large and sinewy hands.

WHEN Longfellow wrote those lines he drew a word picture that is deeply American. His poem has come to mean much to a multitude. Even to those who have never known a living chestnut tree it carries meaning; to those who have known chestnuts it is full of nostalgic sentiment. It is tragic that this tree has become only a memory to older people, and just a tradition to the young; that it has been practically wiped out by a fatal and incurable plant disease.

To be sure, we are now told that the chestnut Longfellow was writing about was a horse chestnut, which bears an inedible nut and is an importation from Europe. However, it is the name that counts. Both our ill-fated American chestnuts and the horsey variety are handsome trees. And it is possible to report that a chestnut bearing an edible nut is staging a real comeback in the United States. It has not been an easy march toward victory.

The native American chestnut, *Castanea dentata*, seems, however, doomed to extinction in its native form. This tree, which grew in forests to a height of 60-100 feet, was attacked about forty years ago by the blight, a fungous disease that came from Asia. By 1930 practically the entire supply of native chestnut timber had been killed. Since that time only dead wood has been available for lumber and other purposes. The only chestnuts became those imported from Italy and Spain, plus a small supply from Japan.

The edible European chestnut is a different species, *Castanea sativa*, and is not hardy in this country. Furthermore, it is being attacked by the blight abroad, a serious matter because not only is the chestnut an important source of income and food in the countries where it is grown, but it also comprises about fifteen percent of the forest acreage in Italy. Chestnut meal is ground into flour in Italy, and also used as food for hogs.

The European chestnut grows to even greater size than did our native tree. There was one on Mount Aetna, for instance, that had a diameter of sixty feet and that was reputed to be 2000 years old. It is said to have once sheltered a hundred horsemen at one time in its hollow trunk.

The chestnuts sold on our streets and in stores today

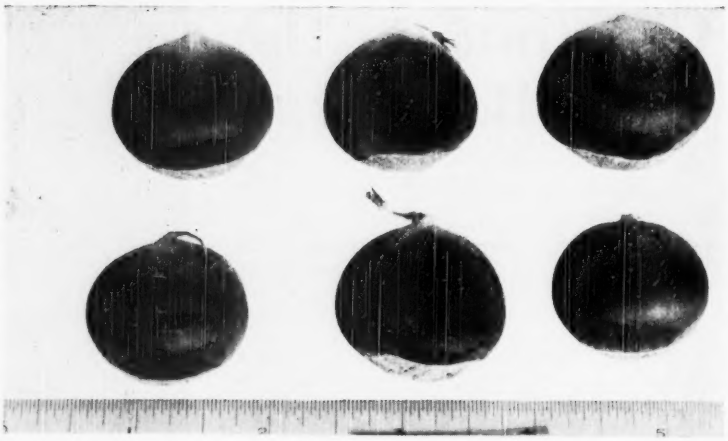
U. S. DEPT. OF AGRICULTURE PHOTOGRAPH

Miss Janice McKay of Beltsville, Maryland, holds a basket filled with chestnuts and the promise that we may again enjoy that autumnal pleasure of gathering these nuts. These are from three varieties of Chinese chestnuts on which scientists have been working to find a tree to replace the American trees, victims of blight.

are almost entirely from Europe, although a small commercial production is now coming from orchards planted in this country.

So swift was the spread of the chestnut blight in this country that, by the time I left central Ohio for the East in 1919, there was not a single living tree of any size left in southern Connecticut, to which I migrated. The woods were full of dead trunks of towering giants, many of them four feet or more in diameter. Only suckers from the stumps were living. These still valiantly struggle against extinction, and grow sometimes to be fifteen to twenty feet tall before they are killed back. The larger sprouts continue to bear nuts, and it is from these that hybridists labor to develop strains that will eventually restore the chestnut as an important forest tree in the United States.

One might wonder why there should be so much fuss about the chestnut when we have so many other trees valuable for timber and food? The chestnut used to be our most important source of tannin, for use in the tanning of leather. Until recent years we were still relying on the bark of dead chestnut trees in the forest as an important source of tannin. Also, the chestnut is a valuable lumber tree as it grows tall and straight. The wood is rather porous but strong and durable, and it takes on an interesting oak-like finish



These are nuts from the parent tree of the Nanking chestnut, the first-choice recommendation of the U.S. Department of Agriculture. This variety is now being grown commercially in nurseries. It is a quite fast-growing tree and bears nuts freely.

for furniture and wood trim. Because of its resistance to decay, chestnut was valuable for fence posts and rails for picket fences. It was a handsome tree with long, interestingly dentated leaves that had a glossy finish. Only at blossom time was the chestnut at all objectionable, for then the long catkins had a heavy odor that was offensive to some people. This minor liability was forgiven when the tree was heavily laden with nuts in the autumn.

These considerations apply, of course, to the native American chestnut, or a hybrid of it. There are, however, two oriental species that can be grown in the United States and which *are* blight resistant — the Chinese, *Castanea mollissima*, and the Japanese, *Castanea crenata*, of which there are a hundred different varieties. These varieties vary considerably in habit, size and quality of the nuts. The Chinese varieties seem, on the whole, to be definitely superior to the Japanese for purposes of hybridization experimentation.

The oriental varieties show definite blight resistance, although the trees may be attacked and the bark show lesions, even to the extent of affecting the trunk and killing back certain branches. But the trees do not die, and usually recover without serious killing back or injury to the main trunk. This is important. However, the Chinese and Japanese chestnuts do not possess the qualities that make them desirable as forest trees. They often spread out like an apple tree and do not have a main trunk. While this makes them attractive, and desirable for decorative planting on a small place, they have no value as timber. The nuts, too, are variable as to size and quality. It is for this reason, and also because the orientals are not completely hardy, that the hybridists are busy trying to develop strains that will combine the best qualities of each species — good trunk, nuts of good size and flavor, hardiness and resistance to the blight.

A tall, straight trunk of good size will make a valuable forest tree, producing not only timber but also bark for tannin. Thus the tree breeders have set quite a nice little chore for themselves. Early maturity and rapid rate of growth are also important qualities for any forest tree, and especially for one that bears nuts or fruit.

It happens that I live in a community where there are a

A basket of chestnuts still nestling within their prickly burs. These were produced at the Connecticut Experiment Station at New Haven, which supplied this photograph.

good many chestnuts. These are all orientals and I believe that they are nearly all of Chinese origin. The largest one I know is on the place of a brother-in-law where I have spent the last three summers. It has a twenty-inch trunk and it spreads out like an apple tree over the garage and driveway. It is a handsome tree when in leaf or in flower, and it bears a prodigious crop of nuts almost every year. Before the nuts ripen the gray squirrels begin the job of harvesting by cutting off the small branches on which the nuts are borne. These nuts are immature but the squirrels keep up their destructive work anyway. When the remaining nuts have filled out and are about ready to fall, there is a race to see who gets them first. This tree must produce several bushels of edible nuts a year, but nobody has ever been able to measure them because of the competition of the squirrels. However, since there are several other chestnut trees of bearing size on the place, we do not begrudge the squirrels what they take. After all, they appreciate the good things of life, too, and other nut trees in the neighborhood are not too plentiful.

Arthur Harmount Graves of the Connecticut Agricultural Experiment Station, who is in charge of the chestnut breeding work in that State, asserts, however, that the squirrel is our greatest menace to the chestnut crop. There are several insect pests, also, including the cicada, but these can be controlled on a small place by spraying. Aside from that, and an occasional pruning to take out dead wood, the Chinese chestnut is an easy tree to care for.

The American chestnut prefers a rather deep, porous, well-drained soil. It tolerates soil acidity, but will grow in soils that have some lime content. In its native habitat it is associated with the Appalachian region and adjacent territory. Its range extended from southeastern Maine, across southern New Hampshire and Vermont, through southwestern New York, and Ohio, extreme southern Michigan and thence across southern Indiana and through Kentucky and Tennessee, and back east through northeastern Mississippi and northern Alabama and Georgia. From there it followed the eastern edge of the Alleghenies, skipping the coastal region north to Delaware and New Jersey, and from there extending through southern New England to Maine. In central Ohio, where I grew up, we had no chestnuts, it being a limestone region, but they were native to the hill counties farther east, these being forested, acid-soil regions. In cultivation, however, the chestnut is fairly adaptable, but it still demands good drainage. The range of the oriental varieties and their hybrids will probably be fairly wide, but it is too soon for us to know exactly where they will grow well.

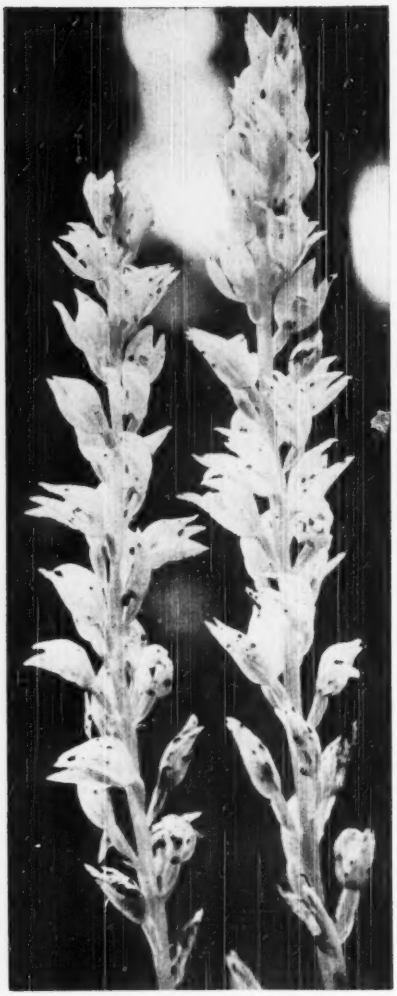
The battle against the chestnut blight has been a slow, uphill fight that has not yet been won. Although there is no hope of saving the native chestnut, the work of the plant breeders has been greatly helped by the fact that sprouts from the roots of old trees keep coming up year after year. A search for possible parents of new blight-resistant hybrids has been carried on by

PHOTOGRAPH BY ROGER RUSSELL

A young chestnut tree growing on the campus of Swarthmore College in Pennsylvania. This tree shows an upright growth in contrast with the usually flatter growth of the oriental species of chestnuts. Through hybridization attempts are being made to take advantage of the blight resistance of the orientals and to develop a chestnut that will also have value as a timber tree and that will produce a good bark for use in tanning.

Dr. Graves in Connecticut, and specialists in the United States Department of Agriculture. In the Hampden, Connecticut, plantation Dr. Graves has more than 2500 trees, varying in height from a few inches to thirty-five feet and comprising about 1500 hybrids. These represent more than fifty combinations, and nearly every species of chestnut in the world. Work is also being done in Maryland, North Carolina, Georgia, Alabama and California by men in the Division of Forest Pathology of the U. S. Department of Agriculture. One of the obstacles that has to be overcome is the fact that too often in a hybrid it is the American parent that shows up with dominant traits, including susceptibility to the blight. This breeding work is slow to produce results, but, considering the importance of the forest crop to this and other nations, it will continue to receive the attention of leading plant breeders. Eventually the problem of the chestnut blight, the white pine blister rust, and other plant diseases will no doubt be solved.

Real progress in the search for a useful chestnut to replace the native species (Continued on page 219)



Phantom Orchid

By LEONARD WILEY

THE narrow trail led through the deep woods. Suddenly I stopped, for there at my feet was a Phantom Orchid. I gasped with astonishment for I had never expected to find this rare and beautiful plant.

Realizing that the plant would be destroyed because it grew on the trail, I dug it up as carefully as I could. The soil was broken rock and loose humus, so that balling the roots was impossible. Although it was planted carefully in a friend's garden, it disappeared the following year, after blossoming weakly.

One might spend a lifetime in the woods and never see this orchid, *Cephalanthera austinae*, for it is a phantom indeed, the rarest of our natives. The entire plant is waxy white, except for a golden throat in the flower.

The cold language of botany cannot describe the ineffable beauty of the delicate petals and the graceful flowers. In fact, it cannot be described at all. No tongue, however eloquent, can express the beauty revealed to the eyes.

It was merely by chance that I stumbled upon it. Although I had never seen it before I recognized it at once from the excellent photograph in Leslie Haskin's *Wild Flowers of the Pacific Coast*. I had looked for it often without any real hope of success, but always with the thought that some day Nature might be kind and lead me, unknowingly, to her diminutive white altar in the deep forest where this lovely orchid is an elusive dweller.

This chance meeting was the peak of my botanical career in the outdoors up to that time. As the years went by, I asked various wild flower fans and botanists about it, but no one was able to help my painstaking and aimless search.

One day, however, a friend told me his wife had brought home a white flower. It was *all* white. I thought, of course, it must be an Indian Pipe, but his description did not fit the plant. At his home I saw my second Phantom Orchid in a glass on a window sill. It had been found a short distance from Gresham, Oregon. In a space no larger than half an acre, and in the shade of a grove of fir trees, I found seventy plants by actual count. I spent most of a Sunday forenoon there photographing and studying them.

This orchid is entirely lacking in green leaves, which have been reduced to white sheathing scales. It is a true saphrophite, one of the many such plants found in the Pacific Northwest. Its perfume is as delicate and rare as the blossom itself. If you are a flower lover, and are fortunate enough to discover this plant, you will never forget it. Usually there are half a dozen or so blossoms upon each stem, although they may number up to forty. The lower blossoms open first, assuring a succession of bloom. They are perennials. I dug around one plant with my trowel and found the stump of the previous year's flowering stem. Two inches below the surface of the ground the heavy, fleshy roots spread out and downward for a considerable distance in their search for food. The roots inside are white, the same color as the stem, and the outside has a thin layer of light brown skin with the white heart showing through. The stems vary in height from six to twenty inches, the shorter ones having fewer blossoms.

As a cut flower it remains fresh fairly well, but the buds do not open. The stems bend toward the light. This is a surprising quality in a plant that is wholly without chlorophyll, and presumably lives entirely independent of light. The flower seems vaguely to remember that, somewhere in its misty past, like all normal plants, it had green leaves and looked to the sun for nourishment. But when the orchid became a dweller of the deep shade (Continued on page 218)

The female sea elephant is as beautiful as a seal. Good poetry could be written about her big soft eyes. Her hide is satin, with a pearly look, and she is very curvy.

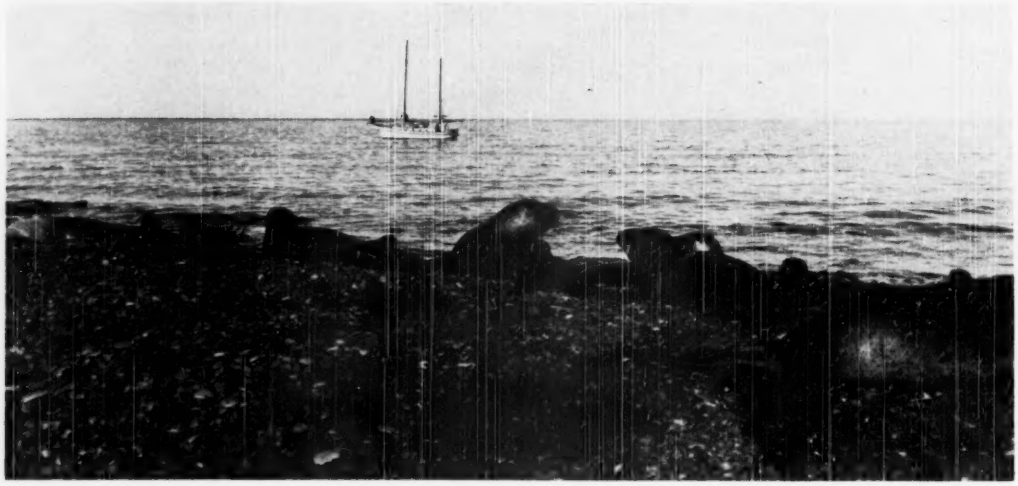
The Sea Elephant Is Peculiar

By JUDY VAN DER VEER *and* GEORGE LINDSAY

Photographs by George Lindsay

ALTHOUGH he is everlastingly irked and irritated by his fellows, the sea elephant likes to be with his friends and relatives at all times. He is protected from man, and all he has to do is doze in the sun, play in the water, toss sand on himself, and eat. Even so, he seems never to cease to complain. Even when he is asleep he grumbles. A herd of sleeping sea elephants is as noisy as anything you can imagine — each big, slumbering beast is busy snoring, moaning, burping, sneezing, wheezing, sighing, roaring, groaning, muttering, gurgling. There arises a cacaphony of all possible human and animal sounds.

The sea elephant does not care to wake up and look at you, but if you insist — and about the only way to make him notice you is to kick him in the ribs or throw rocks on him — he will open one big, beautiful, round eye and stare at you fixedly. Unable to believe what that eye sees, he will shut it and try the other. After examining you for a while, first with one eye, then with the other, he may decide that the best course is to go back to sleep again, or he may go to extremes and look at you out of both eyes at once. This wearies him greatly, so unless you continue to bombard him, he will return to his slumbers. If you persist you might be able to make him get up and walk away, although walk is scarcely the word for his means of locomotion while on land. Perhaps it would be better to say that he undulates. He moves as does a measuring worm. After he has gone a short distance it occurs to him to look at you again, but for this he does not turn his head around as any ordinary beast would do. He simply tilts his head back and stares at you upside down. This is likely so to shock him that he decides to go jump in the ocean. But before he has reached the water he may have reached the decision that this is all too much work, at which he promptly goes back to sleep again.



Guadalupe Island off the coast of Baja California is a haven for the sea elephants. There they are protected from molestation by man and the herd is gradually increasing.

A sleeping sea elephant is a relaxing sight. Although his slumber is noisy he is not bothered by his own thunder, and his sleep is deep. Flies walk on him, and with a flipper that looks slightly like a gloved hand he will rub a fly away from his closed eyes, wipe his nose, which, by the way, has nostrils that he opens and closes at will, or sleepily massage his belly. Except when he is shedding, his body is as beautiful as silk.

This animal sheds in early spring, hide and hair coming off together in huge patches. His new skin is a brilliant and unholy pink. Since the average male is about sixteen feet long, with an eleven-foot girth, perhaps you would not care to imagine what a pink sea elephant looks like. Even when he is not pink, his face is so unattractive that you wonder why any she sea elephant ever feels romantically inclined. He does, of course, have beautiful eyes, but he has no visible ears, and his nose is much too visible. It is his nose, sixteen inches long, resembling the trunk of an elephant, that gives him his name. The female, on the other hand, is as beautiful as a seal. For a sea elephant she has a most attractive nose, and good poetry could be written about her big soft eyes. Her hide is satin, with a pearly look, and she is very curvy.

Deafening as is the sound of a herd of sleeping sea elephants, it is as nothing compared to the sound of a colony all awake. One of the rigid social rules is that, if a sea elephant is reclining, no other sea elephant walks around him. It is customary to walk, or rather, undulate, right over him. When a large company are moving toward the shore, the under elephant is trod upon by them all. This causes him to utter all the aggrieved sounds at his command, at the same time he keeps biting whatever portions of the trampling ones that he can reach. A sea elephant is greatly distressed at being bitten by the sea elephant over whom he is walking, so he calls upon heaven to witness his discomfort.

When irked beyond endurance the elephant will open his mouth wide, undulate backwards, and make a trumpeting sound. He likes to blow the end of his trunk full of air, put it in his wide-open mouth and make one of his most impressive noises. It is an uncanny, trumpet-like call, which also has the quality of a snore, and sounds as if it came from a great distance. Just how many different sounds and variations of sounds a sea elephant, whether happy or distressed, can make, is only to be guessed at. Let us simply say that he is very noisy.

The diet of the sea elephant seems to be squid, seaweed and fish. Apparently he has no trouble finding food, for one totally blind old fellow was as fat as any young one with two good eyes. Like seals, the whole herd will play for hours in the sea. Their ability to open and close their nostrils comes in handy for submerging purposes. Water is the element in which they are the most beautiful. When the swim is over they head slowly for the shore, lifting and spreading hind flippers to allow each low wave to help them through the shallows. Once clear of the water they become ponderous, ungraceful creatures, each intent upon getting his enormous bulk up on the beach. It is such hard work that, of course, they all have to go to sleep again.

The home of the sea elephant is Guadalupe Island, off the coast of Baja California, about 180 miles southwest of San Diego. Its shores are bold, rocky cliffs. The island is of volcanic origin, and apparently was never connected with any mainland, so life came to it through or over the sea. The island — six or seven miles wide and twenty miles long — is mountainous.

The life of the sea elephant when on land is a lazy one, and their slumbers are noisy and provide a wide range of animal sounds. In the sea they are one of the most graceful of animals, but once on land they move ponderously and with a complete lack of grace.

its north end rising to 4500 feet. Although much of the area is arid, the high part gets moisture enough so that at certain seasons there is grass and water in the mountain valleys.

Guadalupe has had a tragic history. Because of its remoteness from the mainland and the fact that its plant and animal life came from across the water, it held great interest for naturalists. Once it was beautiful with plants and birds. But, long years ago, someone had the unhappy idea of turning it into a goat ranch. The goats thrived, but the venture was a financial failure and the island was left to an ever-growing herd of goats. Cats were put on the island, and they, too, multiplied. The goats went to work on the vegetation and the cats went to work on the birds. Whalers had gone to work on the sea elephants, as one carcass supplied a goodly amount of oil. The fur seals that once lived there were shot and clubbed until not one was left alive.

During dry years the goats sip sea water and hundreds of them starve. The island, which should be the delight of botanists, is denuded of most of its vegetation, and some of its peculiar forms of birds have become extinct. High on its northern mountain are old groves of pines, cypresses, oaks and palms, but no young trees at all. The pitiful, famished goats give no young tree a chance to grow.

At one time the sea elephant ranged almost as far north as San Francisco. By 1860 he was so nearly exterminated that the slaughter was no longer considered worthwhile. Until 1880 he was left alone, during which time the herd built up again. That encouraged more killing for oil. Four years later he was considered extinct. Not until 1892 was another sea elephant seen at Guadalupe Island.

By 1922 the herd had grown to nearly three hundred. It was then that President Obregon of Mexico declared the island a government game reserve. Unauthorized landings are prohibited on Guadalupe, no sea elephant is to be killed or molested within three miles of its shore.

The island, which, because of the interference of man, has turned into an unhappy place for goats and vegetation, cats and birds, is at least a sea elephant haven. Some of the older ones have even established bachelor quarters on a beach of their own, where they can argue and complain happily the rest of their days. Some have migrated to the San Benitos Islands, miles away from home.

For a long time little was known of the diet or breeding habits of these prehistoric-looking monsters. Now we know what they eat, that the breeding season is in early March, that the period of gestation is about a year. Mating takes place in the sea and is accompanied by heart-rending screams of the female and great sputtering sounds as she is pushed under the surface. The male is a masterful fellow, selecting his mate on the shore and driving her into the water. Apparently she has no voice in the matter; the suitor that herds her into the sea proclaims himself her master.

The pups are black and so fat that, like many of their elders, all they want to do is sleep between meals. Even if they wanted to be active they could not be, because they are much too fat to move. By the time they are yearlings they are handsomer, slimmer, and extremely playful. They are brownish-gray, with long whiskers, and fond of screaming. They can scream as ably as peacocks.

One young fellow, discovering the bowline of a moored boat, spent all morning playing with it, swimming under it, flipping his body over it, screaming joyfully at his enchanting new plaything. By afternoon he was too weary to continue the over and under process, so his play consisted of hanging on to the line

and letting his body ride up and down, up and down with the swells. It was a sad time for him when the little boat went away. No doubt he searches the seas for another boat to come to provide him with entertainment.

The play of young animals is a form of schooling for adult life. The kitten that pounces on a spool of thread is learning to hunt; the puppies that wrestle and bite each other are learning to protect themselves. The young sea elephants have mock battles with each other in preparation for the time when they will be big, quarrelsome males.

It seems incredible that anything so sleepy as old sea elephants would indulge in fighting, but this they do, in a slow and weary manner. Two males crawl toward each other until, within fighting distance, they rear up on their front flippers, carefully draw their trunks into wrinkled folds above their mouths, and prepare for combat. Uttering fearsome snorts and gurgles, they strike at each other's necks, using their large canine teeth in an attempt to rip tough hide. The skin of the under surface of the neck and the forepart of the breast is so thick that, while wounds are inflicted, no permanent damage is done. A sea elephant cannot concentrate on fighting for long; soon the source of wrath is forgotten, and the idea of taking another nap becomes appealing. Before any decisive blows are exchanged the combatants are likely to be snoring companionably side by side. The old males are practically hairless about the neck and breast, warty and well-calloused from years of fighting. Anyone seeing and hearing such a battle must feel that he has been transported back toward the beginning of time when monsters crawled out of dark water to thrash around on shore.

Although man is not now against him, the sea elephant does have an enemy. The killer whale so terrifies him that it has been said that even his dreams are concerned with danger. This seems reasonable to anyone who has heard the sleeping beasts. Only nightmares could cause such anguished sounds. In spite of the great, clumsy size of the sea elephant, and the fact that, aside from his eyes, he lacks beauty, he is a most appealing animal. There is something pathetic about him that makes you want to feel protective.

The male sea elephant is far from a beauty. Here the nose, which resembles a trunk of an elephant to some degree, is in position for combat.

Let us hope that the sea elephant's future will be happier than his past, for if ever again his tribe is killed for oil, the killing should be sharply controlled. There must be protected breeding stock to replenish the herd. But it is hoped that it will be a long time before he is again, for any reason, molested by man.

Answer to a Child Who Loves Birds

By GERHARD AND ESTHER FRIEDRICH

He is the One, dear child, who knows the names
Of all the many, many kinds of birds,
Their various sizes and peculiar shapes,
The colors of their plumage, and their beaks,
The patterns of their notes, the ways they build
Their sundry nests, the tints of all their eggs
(The freckles on them, too), and those who spend
The winter with us, those who migrate south,
And how they guess the time and spread their wings,
And how they find the route and choose a home.
The old ones and the young, He made them both
In His mysterious workshop with His hands,
And sent them forth as tokens of His deep,
Unending love. Look, there's a cardinal!

NEW YORK ZOOLOGICAL SOCIETY PHOTO

Fishes sometimes go in for high society. These have ganged together for a big night at the local lodge.

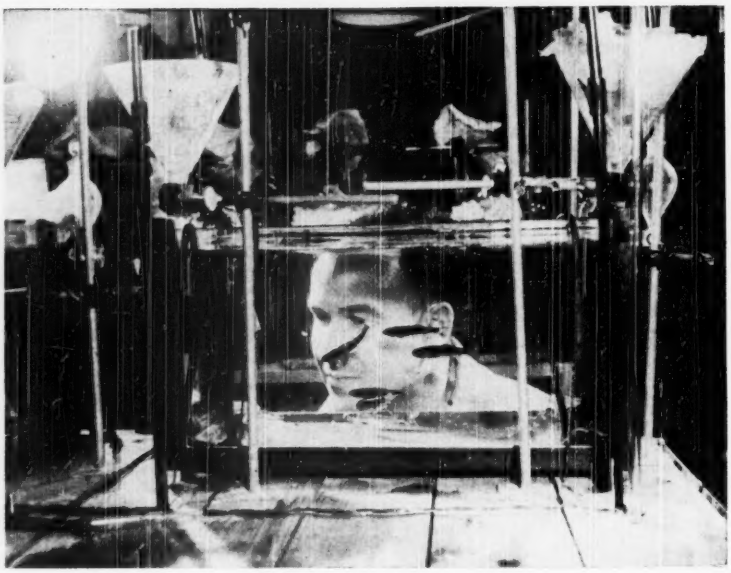
Fishes Are Not So Dumb

By CLAY SCHOENFELD

If you think fishes are simple, aimless creatures, you are in for a surprise. Scientists now tell us that the social life of fishes is a rather highly developed affair. Fish life, they say, amounts to a lot more than a long swim.

Did you ever see, for instance, a school of "soldier" trout? I watched one once, moving up the Brule River in northern Wisconsin. Hundreds of individual rainbows were all swimming in the same direction, and at the same speed. Each one was a set number of "paces" from his neighbors, the whole aggregation lined up in ranks as perfect as any military formation. The school moved like a well-drilled platoon — now doing double-time, now resting at ease, now splitting to avoid an obstruction, and then closing ranks again. Here was a battalion of trout with enough "human" precision to satisfy a West Pointer!

Fish schools like this have fascinated naturalists for many years. Dr. Albert Eide Parr of the New York Aquarium has determined that schooling is simply a function of sight. Working experimentally with mackeral, he discovered that whenever two fishes see each other, they come together until there is a small but definite distance between them. Then they swim parallel to each other, maintaining the interval like a couple of army privates. The formation of a school automatically comes about when more than two sociable fishes get together.



Scientist Theodore Walker, now of La Jolla, California, has had good success teaching lessons to a tank-full of minnows.

Other researchers have confirmed Dr. Parr's lead by proving that blind fishes do not school, and that fishes will attempt to "school" with their reflection if a mirror is put in a tank.

Some fishes, like the perch, school more or less all the time. Others, like black bass, school under special conditions. Smallmouths form close aggregations — or "bass clubs" — in the wintertime. Do they keep warm by this sort of "bundling" under the ice? Nobody knows exactly.

Why some kinds of fish form schools, and what they accomplish by the habit are among the unanswered questions about fish behavior. The schooling habits of fish, however, have been known and put to use by fishermen for many years. Freshwater fishermen know, for instance, that where they catch one perch they are apt to catch a string.

Perch fishermen have the school-fishing system refined down to clockwork on Lake Mendota, Wisconsin, where the perch perform daily migrations as regularly as subway commuters. The Mendota perch move shoreward from deeper water in large schools at almost exactly one hour before sunset during the summer months. The perch will cruise along the shore at the 18-foot contour, feeding as they go, until the sun has disappeared. Then the perch disappear, too.

This daily migration of the Mendota perch is no idle speculation on the part of anglers. It has been scientifically proved by John Bardach, an Iowa biologist, who used gill nets, photoelectric fish detectors, and diving apparatus to trace the movements of the perch all last summer.

Just as some fishes are as clickish as sorority girls, some are as anti-social as Jesse James. A young muskellunge, for example, is a bloodthirsty character, and he will eat brothers, sisters, and cousins with gusto if given half a chance.

An individual bass is sometimes a regular desperado, too. He will lurk in a hideout and then dash out to raise havoc with passers-by — including other bass.

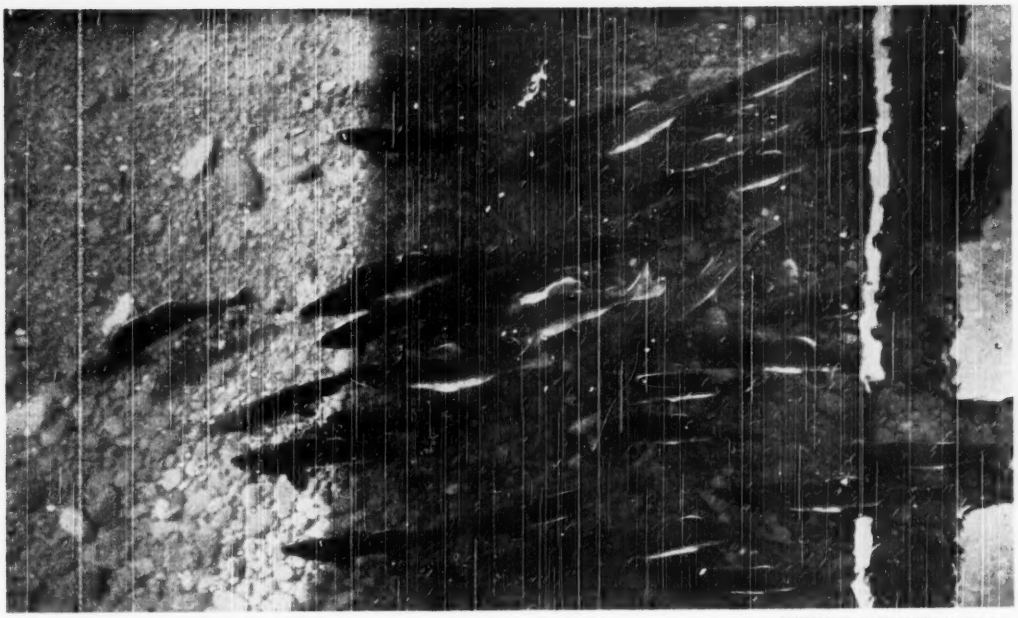
This predatory habit with bass is a headache for hatchery men, but it can be controlled. When large numbers of smallmouths in rearing ponds in Ohio were being lost through cannibalism a few years ago, Dr. T. H. Langlois discovered that the trouble was due to two factors — competition for food, and plenty of hiding cover for "gangster" bass. He pulled out all the plants in the ponds, stepped up the rations. All the bass got together in a nice, happy family.

With some species of fish, aggressiveness is a refined proposition, in accordance with a well-defined social ladder. The "kingfish," in such a situation, is usually a large male. He can nip all the other fish in his territory. He gets first crack at food, and he has his choice of swimming space and mates. The number two fish, or crown prince, can lord it over all but the kingfish. The Number three fish can boss all but numbers one and two. And so on right down to the serf-fish at the bottom of the ladder, who can nip nobody and must take it from everybody.

This "peck order" is fairly common in aquarium fish. To what extent it is carried on in the wild among freshwater species, nobody knows for sure.

Fish eyesight is not so poor as scientists once believed. Working on mackerel at Woods Hole, Massachusetts, Arthur Shlaifer of the Fish and Wildlife Service has found that a normal mackerel will school with an outlandishly painted buddy. But he will not fall for a dead mackerel manipulated by wires, or for a blindfolded mackerel that swims awkwardly. A fish, in other words, may not worry too much about odd colors, but he is a stickler for life-like movement.

Fish vary a good deal in their hearing abilities, according to an Austrian scientist by the name of von Frisch. The Vienna expert has discovered that minnows and catfishes can hear out-of-water sounds as well as humans, and in-the-water noises better than humans. But pike, perch, and trout have poor "ears."



PHOTOGRAPH THOMPSON STUDIO

A new theory, based upon studies of the fishes, suggests that salmon may be able to "smell" their way back home to their native streams from the sea.

It is all due, apparently, to a difference in body construction.

Von Frisch has also knocked into a cocked hat the old theory that fish are dumb. Minnows, at least, can "talk," he says. He has detected their soft, "piping" sounds with a sensitive microphone.

Minnows are not so dumb in another sense of the term. Prof. Arthur Hasler of the University of Wisconsin has taught "lessons" to a school of minnows. He and his staff fitted ten laboratory tanks with circulating water pumps and electric shockers. The shockers were located near feeding troughs at the ends of the tanks. He then introduced plants with various odors into the tanks, where sixty blinded, bluntnose minnows had been placed. With half the plants, Hasler would feed the fish. With the other half, he gave them an electric shock. Most of the minnows were able to learn to distinguish by smell between the plants that would "shock" them and the others that meant "food."

So acute are the olfactory senses of these fishes, and so good is their ability to learn and retain "lessons," that Professor Hasler is now using them to detect, quickly and accurately, any minute impurities in municipal drinking water — impurities so dilute that they defy chemical analysis.

Hasler's work with minnows has also led to a new theory that migrating salmon may be able to "smell" their way back home from the sea. Hasler and his staff have been able to train their minnows to distinguish between the natural odors of neighboring streams. So, as they put it, "olfactory stimuli may be factors in directing fishes to their home waters."

How a coastal salmon gets back home has puzzled scientists for years. The fish is reared in a freshwater river, migrates to the ocean for four years, and then returns unerringly to his home waters to spawn and die. Dr. Hasler thinks every stream may have a characteristic smell that a salmon can remember. His hunch is based on his success in discovering that blinded bluntnose minnows can learn to smell minute differences between the waters of Wisconsin creeks.

"If salmon can smell as well as minnows, it may very well be that it is a long-remembered stream odor that guides them back home," he says.

His next experiment will involve salmon fingerlings and coastal stream water.

Fishes are not only smart, they are also about as individualistic as humans. Trout, for instance, can be both as stay-at-home as hermits and as migratory as gypsies. The New York Conservation Department reports that a brown trout was caught last summer in a stream about a mile from the spot where it was planted eight years ago. Meanwhile, another brown was caught 89 miles downstream from the point where it was stocked the year before.

So far we have been talking mainly about freshwater fish. The social life of other species is mighty interesting, too.

For example, a goldfish is lonely and frustrated with-

out company, according to James W. Atz of the New York Aquarium. A single goldfish in a bowl will actually become a "mental case." The vicious piranhas of South America are so scared of each other that they will try frantically to escape through the glass walls of a tank, when two or more are placed together. They seem to know the reputation of their kind.

In Siam, fish are reared and trained as fighters. These Siam fighting fish, or betta, have been employed in sporting contests for several centuries, and are selectively bred for fighting qualities. They fight by biting and tearing at fins and scales.

Charles M. Breder, Jr., has found that the beau gregory, a small, brilliantly colored marine fish, is so jealous of home sites that, when a number of individuals are placed together in a tank, they will kill each other off until the population is reduced to the point where each fish has a territory of its own.

Tarpon "imitate" each other in their regular dashes to the surface for a mouthful of air.

Anglers say that the brook trout are the most "human" fish of all, because they are as fickle as any woman, and will occasionally succumb to a concoction that resembles nothing so much as a spangle from a lady's hat.

All of which indicates that a fish is quite a "person." He can form a society, or he can go his own way if he is a mind to. He can see and smell well enough to earn an "A." He has definite ideas about what to eat and when to eat it.

So the next time you call somebody a "poor fish," smile when you say it!

Cordage from Nature

By ELLSWORTH JAEGER

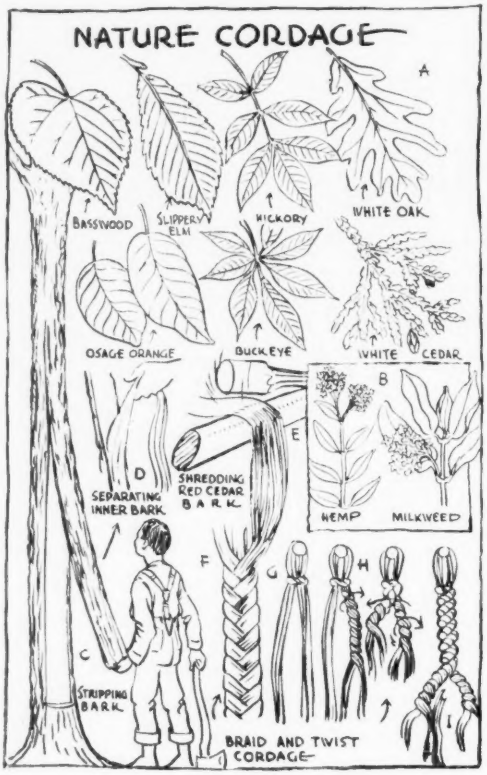
From "Nature Crafts," copyright the Macmillan Co.

NATURE cordage for fishlines and other uses can be obtained from various plants, barks, and roots. The inner barks of basswood, elm, slippery elm, hickory, white oak, Osage orange, buckeye, willow and red and white cedar were used. Plant fibers from Indian hemp, nettle, common and swamp milkweed, wild hemp, yucca, reed grass and psoralea are excellent for making cordage. Another form of cord can be secured from the roots of spruce, hemlock, tamarack, balsam fir, cedar, yellow pine and cottonwood. To make this cord, or "watape," as the Indians call it, soak the long, trailing roots in hot water and remove the bark. The roots will be pliable and easily used wherever cord is needed. Hemp, milkweed and nettle fibers can be separated from the stems by soaking in water.

Inner barks of basswood, elm, hickory, cedar and other trees can be secured by making a cross cut at the lower end of the trunk and pulling long, narrow strips from the tree. These strips are soaked in water, preferably a running stream, for a week or so, after which the inner bark can be easily separated from the outer layer. The broad bands of inner bark can then be shredded into slender strands by running the fingernail down through them.

Red cedar bark was shredded by the Northwest Coast Indians into fine strips, by laying the inner bark over a small log and pounding it with a blunt instrument. The long fibers were used for cordage and the soft, fluffy waste was used for babies, diapers, or for hand towels.

Two common methods of making twine were to braid it, or to roll or twist it. In braiding, take three strands and plait them as you would any braid. In twisting, separate the inner bark into two strands, holding them together at the top with the left hand, or looping them over a nail. Take the right strand and



twist it several times toward the right, then give it a left-hand twist around the left strand. This will bring the left-hand strand over to the right. Repeat the same process until you near the end of one of the strands. Take a fresh strand and lay it beside the short one and twist them together to the right several times and then to the left, carrying on as before. As the end of each strand is reached, repeat this procedure. You can make the twine as long as you wish.

The Royal Albatross

By L. E. RICHDALE

Photographs by the Author

IN 1920, a mated pair of royal albatrosses began to nest on the southern promontory that overlooks the entrance to the Otago Harbor, New Zealand. Even though the nesting area is only twenty miles by a good road from the city of Dunedin, the albatrosses, for sixteen years, continued to nest annually without the fact being known to students of birds. In November, 1936, I visited the area and there, on a grassy path before my astonished gaze, sat a beautiful, white, male royal albatross on a large white egg. Thus commenced my long study of the species.

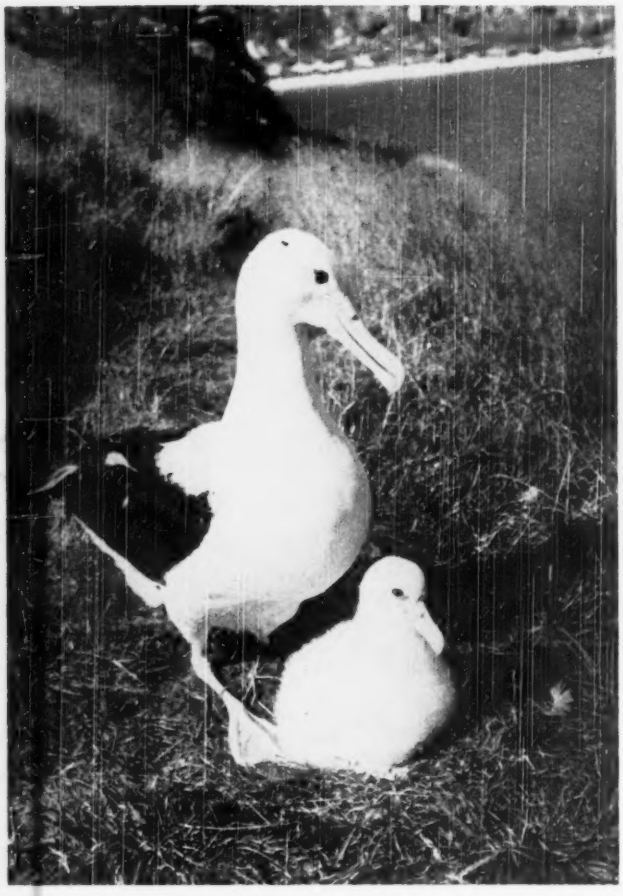
Frequenting lonely places, remote from the haunts of men, the royal albatross has, in the past, preserved a degree of privacy, with regard to the intimate details of its existence, enjoyed by no other large sea bird. Its isolation has, hitherto, screened it alike from the casual gaze of the merely curious and the more searching scrutiny of the scientific observer.

The royal albatross and its close relative, the wandering albatross, have the greatest wingspread of all flying birds, and may measure eleven feet from wing tip to wing tip. When standing erect, the royal is a little more than three feet high and in weight, I found, may vary from sixteen to twenty-two and one-half pounds. At all ages, the adult royal albatross is white all over, except for dark brown feathers on top of the wings and a jet black eye. It is, indeed, a most handsome bird. The wandering albatross, on the other hand, is a dark chocolate color, with a white face when young. With age it gradually becomes white like the royal albatross. During the period when this similarity in appearance occurs, it is impossible, from the deck of a ship, to distinguish one species from the other. One distinction between the two species is that the royal albatross has black eyelids and the wandering albatross gray eyelids. In addition, there are other differences around the nostrils.

Early in October, with but little variation from year to year, the albatrosses return to

Right in the middle of a grassy path the author came upon a beautiful, white, male royal albatross with a single, large white egg. The isolation of the nesting place had, heretofore, screened it from the gaze of the merely curious and the searching scrutiny of the scientist. Here the author was able to carry on a study over a period of years.

Below is a general view of the promontory embracing Otago Harbor, near Dunedin, New Zealand. The site of the nest is the grassy slope at the extreme left of the picture.



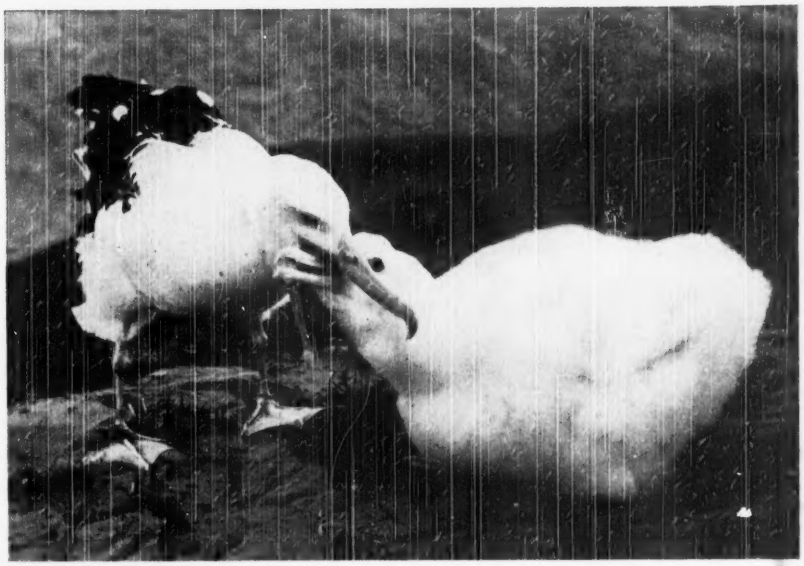
Weighed in the course of the author's studies, the albatross chick tipped the scales at fourteen and one-half pounds. At the left, the female of the pair is shown guarding her chick, which was twenty-one days old at this time.

their breeding grounds. The males, on the average, tend to arrive ten days before the females but some females may arrive before some of the males. The period before the first egg is laid extends approximately for five weeks. In that period many interesting things are enacted. Having banded all the breeding birds and some of the non-breeding birds, the author was able to note exactly what did take place. Statements in the literature infer that, after the birds arrive on shore, courtship takes place and mated pairs are formed. This is incorrect. Breeding birds are already mated when they arrive; in fact, some of them have been mated for years. It seems to me, also, that royal albatrosses mate for life; certainly, after all these years of watching, I have not seen an instance of a "divorced" pair.

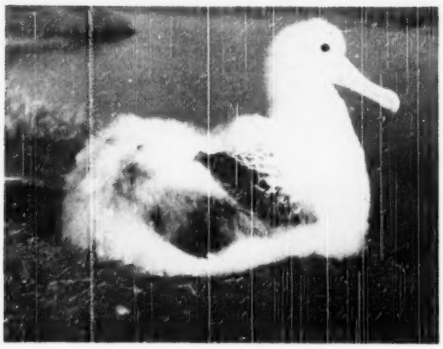
At the pre-egg stage, the male spends approximately fifty percent of his time at or near the nest, and the rest of the time at sea. The female is rarely ashore until the egg is ready for laying, and then only for coition. This means that a single bird present at the nest at the pre-egg stage is usually the male and this is, therefore, an important way to determine the sex of a given bird. Within a few hours after the egg is laid, the male takes his first turn at incubation, an early assumption of paternal responsibility.

Only one large, white egg, weighing from fourteen to sixteen ounces, is laid, in a nest on the ground. Both sexes incubate and the turns on the egg vary from one day to fourteen days. The period of incubation is nearly three months, actually varying from 78 to 80 days, and, as far as I know, is the longest period for any bird in the world. New Zealand has a second species of bird with a long incubation period, the kiwi, which sits from seventy-five to seventy-eight days.

After the albatross chick is hatched, it is brooded continually, by each parent in turn, for five or six weeks. Then it is left entirely alone, except on those rare occasions when the parents return with food. For the first three months, the chick is a beautiful ball of fluffy white down, broken only by the jet-black eye. In this period, feeding occurs approximately twice a week, although there is considerable variation in procedure by different parents. As the feathers begin to grow, the chick is fed more frequently, usually about five times a week, until two weeks before flying, when the feeding rate reverts to the twice-weekly basis. Growing up for the albatross chick takes from seven and one-half to eight months,



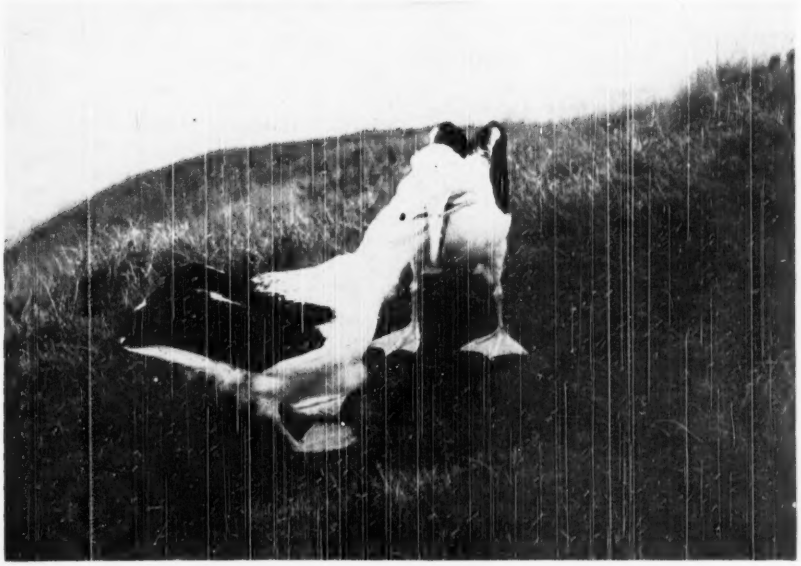
The male albatross feeds his one-hundred-day old chick in characteristic fashion. After the albatross chick is hatched it is brooded by each parent in turn for from five to six weeks. For the first three months the youngster is a ball of fluffy white down, the color broken only by the jet-black eyes. Below is a chick five months old, with the new dark wing feathers showing through the down.



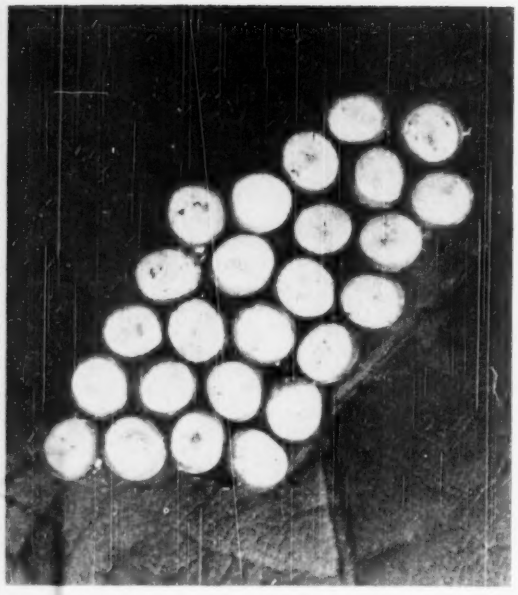
which period is spent at or near the nest. This means that the complete nesting cycle for the parents lasts almost twelve months.

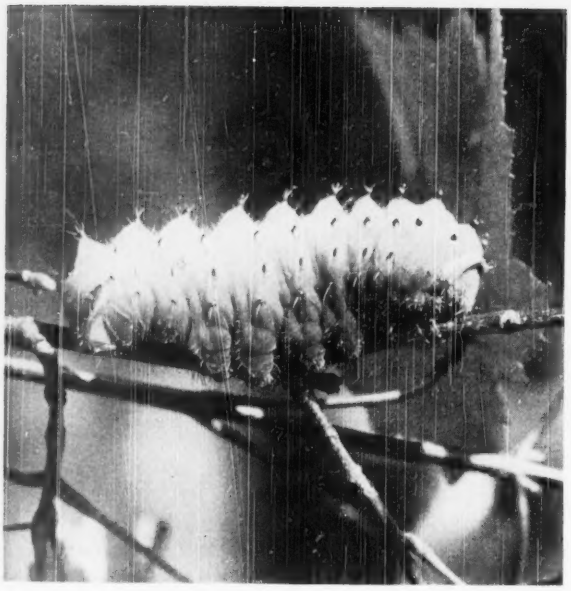
What, therefore, do the parents do about nesting again in the succeeding season? The answer is that, instead of undertaking further reproductive duties, they take a year's holiday and roam the ocean. Those individuals nesting in a succeeding season are a different set of birds altogether. Thus, breeding birds successful in rearing a chick breed every second year and lay one egg every two years. Surely this is unique in bird nesting.

It has been known for a long time that the breeding cycles of the royal and wandering albatrosses are lengthy, but it was usually assumed that individual birds bred annually. Although data on the wanderer are scanty, I feel sure that its cycle is much the same.

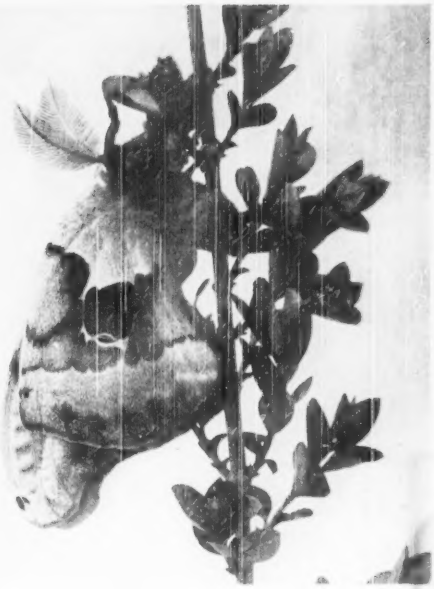


The picture at the left upsets the old theory that the royal albatross deserted its chick during the latter half of its growing weeks. Here is a male feeding its chick only nine days before it took wing. In fact, the albatross returns to feed the youngster about twice a week after the first five or six weeks. Then, after the real feathers begin to grow, the parents increase the feeding periods to about five times a week.

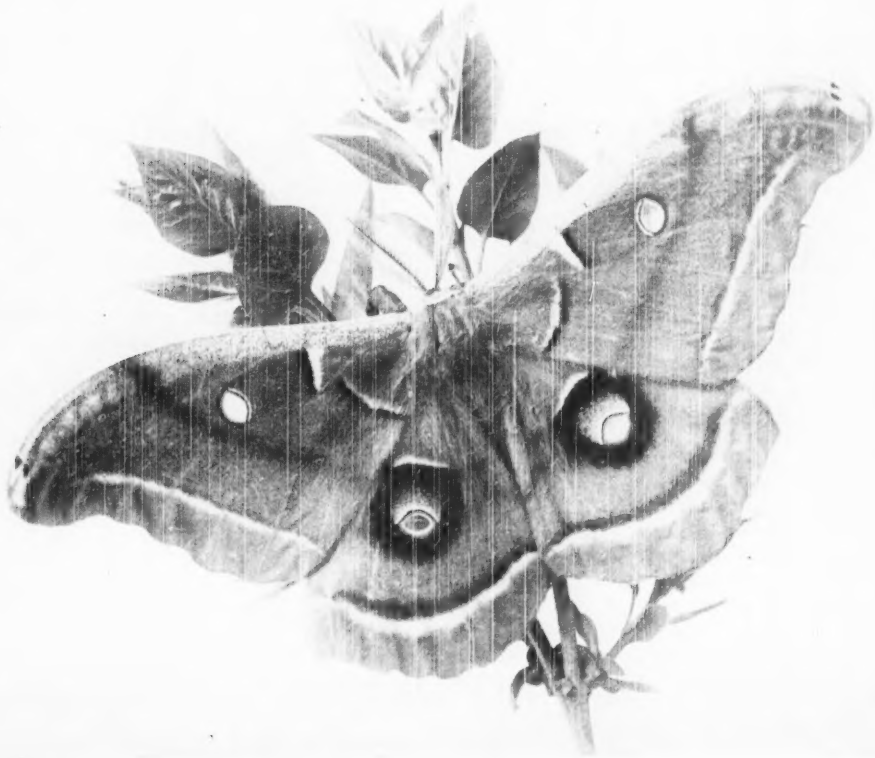




The Polyphemus moth, *Telea polyphemus*, is one of our most beautiful North American silk moths, whose life L. W. Brownell records in picture here. Above, left, are the eggs on this moth. These may be laid on any one of a variety of leaves, since the larva, or caterpillar, of Polyphemus feeds on a number of different trees. The larva, above, right, has the habit of lifting the front part of the body, pulling in its head and assuming a menacing attitude. It is a spectacular green caterpillar. When the time comes for it to make its cocoon (below, left) it has been calculated that it moves its head to and fro a quarter of a million times to weave a continuous thread a half-mile long into the resting place for the pupa. Below, right, is one of the cocoons cut open to show the wintering pupa within. If it were not for the high cost of labor, the Polyphemus silk might be commercially valuable.



Within the cocoon the pupa has gradually gone through its period of transformation and is ready to emerge in the form of a beautiful, nocturnal moth. At the left, above, is a Polyphemus moth just after coming out of the cocoon. Its wings are still crumpled and moist, but are gradually straightening out. Right, above, is the moth with its wings now fully expanded after emergence. Note the delicacy of its feathery antennae. Below is the spectacularly beautiful Polyphemus, its wings fully spread. Its wings are ochre, or sometimes pinkish. Each wing has a transparent spot. Those on the hind wings are inwardly bordered with blue and set in a black ring.



Charles L. Broley, retired Canadian banker and a leading authority on the eagle. Here he poses with two young birds that he has banded. Although past seventy, Mr. Broley climbs high into trees to visit the eagles, using an ingenious device of his own development. He confesses that he is occasionally called "the bald-headed eagle man," for obvious reasons.

Broley—The Eagle Man

By NELSON EDWARDS

Photographs by the Author

CHARLES L. BROLEY is known as "The Eagle Man" and is a foremost authority on the life and habits of our national bird. Now past seventy, he climbs trees, to any height, for the fun of it, although, of course, his object is to study and band young eagles.

With a super-size slingshot, Broley shoots an iron nut attached to a small nylon line over the desired limb, close to a nest he has located. Then he ties a rope of clothesline weight to the lighter line and pulls it over. Then comes a larger rope, to which is attached a small rope ladder that Broley made himself. Then the small ladder is hoisted to the spot near the nest. With the ladder lashed, top and bottom, the eagle man climbs agiley up to visit the eagles. He has banded birds that were in nests more than 150 feet from the ground.

Charles L. Broley of Delta, Ontario, has had a lifetime interest in birds, and for many years was a banker. After he laid aside business cares ten years ago, he decided to spend the rest of his life finding out all he could about America's fascinating bird, the bald eagle. This study takes him all over the country. On his travels, and for obvious reasons, Broley has often been referred to as the "Bald-Headed Eagle Man."

Eagles nest in the same place year after year, adding to and repairing the old nest until it may weigh several tons, and measure ten feet across. Mr. Broley keeps elaborate notes on more than a hundred nests that he watches each year. He has a case history of many nests for ten years back. In the last ten years he has banded more than a thousand eagles, and in that time has had eighty-seven returns of bands. Every return means that the bird met disaster. Broley would be glad if he had no returns at all; that would lead him to hope that the bird was enjoying life somewhere. One unexplained mystery is the fact that there has never been a return from any of the birds banded early in Mr. Broley's study. Whether the eagles

High in a tree is the nest of the bald eagle. It may be an accumulation of years of occupancy, repaired and added to by the birds, year after year. These nests may be as high as one hundred and fifty feet, but this does not daunt the eagle man. Below, Mr. Broley inspects the light but sturdy ladder that he made himself, while, at the right, he is making his agile way up to a nest

Once Charles Broley has located the nest he wants to visit, and where he wishes to band the young birds, he picks out what he hopes will be a sturdy limb near the nest. With a super-slingshot he shoots an iron nut, to which is attached a light nylon line, over the desired limb. A heavier rope is then drawn up and over the limb, and, finally, a still heavier rope to which the ladder is attached. This permits lashing the ladder securely, top and bottom, before the climb to the nest begins.

get wiser as they get older and learn to avoid danger is anybody's guess.

In the East, the area around Tampa, Florida, seems to be an ideal place for eagles. There Charles Broley conducts his studies in the winter months. The eagle's diet is mostly fish and the fishing is good. There are plenty of large cypress trees for nest sites, and the winter weather seems to encourage early incubation. The hatch is usually two and sometimes three birds.

Broley tells some interesting tales about his eagle banding. Once he was dangling on his little ladder a hundred feet from the ground and close to a nest. Suddenly he found that the eagle was not the only creature that had a home there. A nest of yellow jackets disgorged some angry insects, and the eagle man beat a hurried retreat down the ladder. He nursed stings about the head and arms for several days.

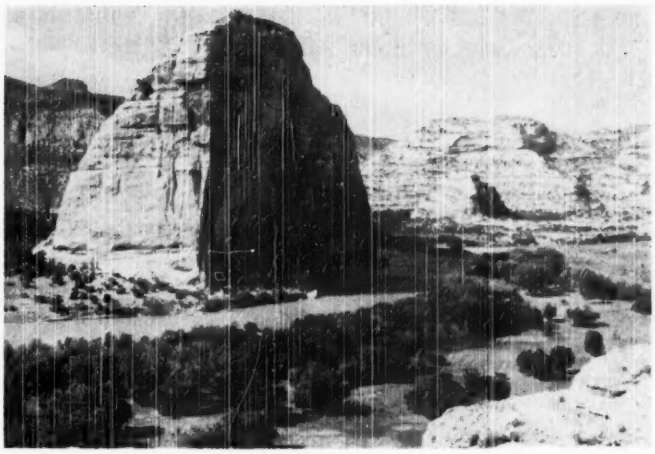
There are more superstitions and old wives' tales about the eagle than perhaps any other bird. Broley debunks most of these, asserting that the eagle is a quiet, gentle bird.

Mr. Broley has two suitcases full of odds and ends that eagles have carried up to their nests. Most of them are objects the birds might have found floating in the water, such as rubber balls, bottles, or electric light bulbs. He has found many kinds of bones and many muskrat traps. Seeing a muskrat struggling, the eagle swoops down, taking muskrat and trap to the nest.

Putting the bands on the legs of the young eagles, two of which are shown below with the bands attached. Mr. Broley has banded more than one thousand eagles and careful record is kept of each one. When a band is returned it indicates, of course, that the bird has been killed, either by some accident or by illegal shooting, for the bald eagle, our national bird, is protected by Federal law, except in Alaska. Mr. Broley says the eagle is a friendly, gentle bird.

Dinosaur Monument Threatened

An Editorial



Steamboat Rock towers 800 feet above the bend of the Yampa River. If the dam project is carried through, it would be flooded up to within three hundred feet of the top, and, of course would deeply inundate the lowlands along the river bed. Roads, transmission lines, quarry sites, structures and town sites would also intrude upon the natural scene at the expense of the National Monument area.

DINOSAUR National Monument includes 327 square miles of spectacular canyons in northeastern Utah and northwestern Colorado. Within it are found, also, a dinosaur "quarry," Indian archeological remains and an interesting variety of plant and animal life. The scenery is outstanding. Through parts of the monument flows the rapid, curving Yampa River, entering from the east, while the Green River enters the area from the north through the wild and spectacular Lodore Canyon.

This is a reservation worthy in every respect of being preserved for posterity as a National Monument. It is the only area in the National Park system that tells the story of the upper Colorado River. Dinosaur has not, however, been developed for public use, due to lack of appropriations, although the National Park Service has complete plans for such development. Also, there hangs over this Monument that sort of threat that increasingly confronts these public reservations of ours. It is the threat of exploitation for power through the erection of the Split Mountain and Echo Park dams. The former dam, 245 feet high, would dry up the Green River for several miles, creating a reservoir that could be maintained at a fairly consistent level. While there would be recreational possibilities in such a body of water, the surrounding picturesque terrain would be irretrievably scarred and the lowlands below the dam ruined.

Echo Park Dam, which would tower to 525 feet above the present river level, would have even more disastrous effect upon the Monument. The scenery and the value of the Yampa Canyon would be impaired for many miles. A widely fluctuating reservoir, with all the hideous results that that connotes, would be created. Geological formations of outstanding value would be inundated, and the beauty and life on the canyon floor destroyed.

As is usually the case, local chambers of commerce, sniffing the money that would come into the area, are thumping the tub for the two projected dams. The estimated cost of this project is $207,100,000. Although this is a power program, it is being represented locally largely as an irrigation plan. A deluge of telegrams to Congress and to the Secretary of the Interior is being inspired by busy chamber of commerce secretaries. The usual attack on bureaucrats is being played to the hilt.

It is curious how all such assaults upon the integrity of National Parks and Monuments follow the same pattern. A local, special and selfish interest is magnified — often distorted — all out of proportion to the greater national interest. The long-term value of the area to *all* the people is ignored. The possibility of arriving at comparable results by relocating projected dams elsewhere — possible in the case of Dinosaur — is sloughed over. Those whose responsibility it is to preserve and wisely administer the handful of areas, foresightedly set aside for all time, are attacked.

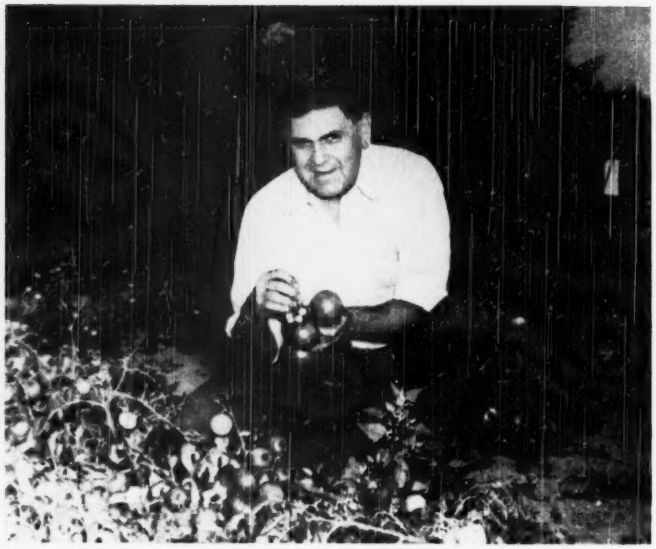
Dinosaur National Monument was established in 1915; enlarged in 1938. It is a notable area. It can and will be made more readily available to the public when funds are forthcoming. It should not be ruined by a short-sighted drive for exploitation that robs all Americans for the benefit of a few.

It would be comforting to be able to feel that the outstanding areas presumably preserved inviolate in National Park or National Monument status will remain so. However, this threat to Dinosaur is typical of other threats — to Glacier, Kings Canyon, Olympic and Grand Canyon National Parks; to one National Monument after another. The integrity of these areas *must* be maintained. Letting down the barriers that protect one area weakens the defenses of all such reservations against the greed of exploiters. All conservationists and Nature preservationists should let their Congressmen know how they stand, also.

He Races Tomatoes

By WILLIAM GILMAN

Photographs by Eleanor Gilman



Dr. A. F. Yeager kneeling beside a row of his latest tomato variety, rich in Vitamin C. In his hands, he shows what the newcomer's ancestors looked like — ordinary tomatoes that were crossed with tiny Peruvian ones, which were sweet, greenish-white and only one inch in diameter. But they were rich in the precious vitamin.

DURING the war a city woman wanted to do her bit by raising a little Victory Garden; but she was an invalid. Her request was for a practical vegetable that she could grow in the windowbox of her apartment.

That problem was right down Dr. A. F. Yeager's alley. The skilled plant-breeder crossed two tomato varieties — smallish Dwarf Champion with extremely early Redskin — and came up with a new hybrid. It was a tomato large enough for slicing, yet growing on plants that need be only six inches apart.

Yeager and his colleagues at the University of New Hampshire Experiment Station have originated so many varieties of fruits, berries and vegetables that he sometimes has to puzzle about new names for them. This time, there was no difficulty. With a chuckle, he christened the new tomato "Windowbox." And it has become a handy new variety. Out in the garden, it requires only the space of a bush bean plant.

Any discussion of the tomato inevitably leads to Yeager, and the many things he has done with this migrant from the tropics. The ordinary gardener is apt to take the tomato, symbol of juicy garden freshness, for granted — except, perhaps, at the beginning of the season, when he moves stakes and earth in an effort to have a ripened tomato ahead of his neighbor.

Actually, the tomato has had a hard row to hoe. Like the potato, it was originally without honor in its native hemisphere. Both originated in the New World; both had to go to Europe and win popularity there, before returning across the Atlantic to become standard American foods. As recently as a century ago, the tomato was still an object of suspicion. Some called it the "love apple," and wanted no part of it. Others considered it downright poisonous.

Glance through the pages of any present-day seed catalog, and it is obvious how far the tomato has come. But not far enough, in the belief of Dr. Yeager, who heads the Horticulture Department at New Hampshire. Here for eleven years, and during twenty preceding years while this modern Burbank was experimenting at state agriculture colleges of North Dakota, Pennsylvania and Michigan, he has been pursuing the perfect variety.

Much of this work has been research aimed at making the tomato better adapted to short growing seasons in northern states. In this, Yeager has been a good example of the scientist who will not be easily satisfied. At North Dakota, when he gave the Great Plains states their quick-maturing, hardy Bison variety, he thought he would drop tomato work. But he could not, and went on to put Victor into seed catalogs. It was an All-American prize-winner, and remains a standard among earliest tomatoes.

But Yeager could not rest on these laurels. When we visited his testing plots at Durham last year, he led past rows of predecessors to his latest favorite — a brand-new variety for which he wished somebody would donate an appropriate name. Its fruit is not only larger than Victor: it ripens a week or more ahead of that early bird.

"Some people raise tomatoes," another horticulturist once said. "Yeager races them."

But ripening speed is not all. Another highly important Durham project is the one to cram tomatoes full of Vitamin C, and thereby make them rival oranges as a mealtime juice. Thanks to help from a grape-sized Peruvian tomato, Yeager already has normal-looking varieties containing two and three times as much of this precious vitamin as do ordinary tomatoes.

All this, obviously, is plant breeding with a purpose. Yeager's goal is to provide healthier, tastier menus for

A freak with practical uses is New Hampshire Midget, the watermelon that can be eaten "on the half shell" only 65 days after planting seed. Dr. Yeager originated this variety to help northerners with short growing seasons, and it has already begun winning popularity because it is handy for small families with icebox-space problems.

the northerner, whose garden and orchard must face spring's late frosts and autumn's early ones.

Tomatoes are only one example of both the motive and method. Take squash, which can be stored and eaten in winter months. Yeager originated the now-standard Buttercup variety to give northerners a meal-sized type equivalent in nutrition, Vitamin A and cooking methods to the south's sweet potato. From there, he has gone on to produce Bush Buttercup and, most recently, Baby Blue, a cross between Bush Buttercup and Blue Hubbard. It sets its meal-sized squash right at the vine's stem, instead of first taking time to grow ten or twelve feet before producing female blossoms. And his "perfect flowering" muskmelons, with self-pollinating blossoms possessing both pistils and stamens, similarly shorten the time required for ripening fruit.

When Yeager came to New Hampshire eleven years ago, a farmer answered his question with the reply, "Sure, we can raise melons, but they aren't fit to eat."

The horticulturist went to work to cure that situation. Three years ago, he introduced Granite State, a firm, excellent-tasting muskmelon that grows fast enough for New England's short summers. Last year, he came up with a watermelon that ripens faster than his hurry-up muskmelons — and promptly set out to get a muskmelon that would beat the watermelon.

Much of this breeding has incorporated Yeager's favorite strategy — less vine or foliage, smaller but quicker fruit. An extreme example is New Hampshire Midget, the canteloupe-sized watermelon that ripens around 65 days from seed. It

Among many new cross-breeding possibilities brought from Korea by E. M. Meader, associate horticulturist, left, is the eggplant he is showing to Dr. Yeager. This odd variety has the virtue of ripening extremely early and bearing heavily. It is being crossed with an American-type eggplant to produce a large, round fruit which will ripen early enough to grow in northern gardens.

is large enough for two servings "on the half shell." In modern days of crowded refrigerators and small families, this handy size can be a virtue. After all, says Yeager, washing one's face in a watermelon is not its real purpose.

In his many projects, he is helped by graduate students who soon catch his infectious enthusiasm and dovetail his work with that of talented colleagues. Under his direction at New Hampshire research is carried on by such an enthusiastic and necessarily patient group of men as W. D. Holley, flowers and lima beans; L. P. Latimer, originator of a rather sensational new strawberry called Great Bay; W. W. Smith, who is developing a "half-high" blueberry by crossing cultivated highbush varieties with native lowbush ones.

Yeager's new breeding associate is E. M. Meader, who was a horticulturist with our army in Korea and brought along a "dowry" consisting of 150 varieties of shrubs, vegetables and fruits, many of which had never been seen before in the United States.

There are also side avenues, like the temperature work done by Russell Eggert, research associate in charge of the university's horticultural farm. It exposes the fallacy of being "cool as a cucumber." On a sunny day, the inside of a cucumber may be fifteen degrees hotter than surrounding air. Or take a tomato, which sunscalds at an air temperature of 98 degrees. That is because the inside of the tomato may be 125 degrees or more — hot enough to coagulate, "cook" its albumen.

Most of the research, however, follows the pattern that has governed Yeager's career. As he puts it: "We search for the best varieties that exist and then, if possible, improve them."

With cooperation from the U. S. Department of Agriculture's plant explorers and from other experiment stations, Yeager is able to shop pretty much all over the world — Turkey, Siberia, Japan, India, South America — for the seeds and cuttings he wants to try in breeding work.

It takes time, sometimes years of patient cross-breeding and selection, for worthwhile results, but Yeager has tricks of the trade that often reduce labor considerably. In tomato work, for instance, he cuts time in third by raising three crops a year — two under glass and one outdoors.

And some of his short cuts are pretty tricky. Even before a peach pit has sprouted, he can examine its interior and decide whether he wants the color of fruit that the tree would produce. From first leaves put out by a seedling, he can tell what color its beans or grapes will be.

When he came to Durham, he astonished a greenhouse laborer by sprouting 1000 tomato seedlings, then throwing away 997 of the plants, keeping only three at blossoming time. He had discovered a way to save time and growing space, saving only the plants that would bear large enough fruit. By glancing at the blossom's embryo, and multiplying this diameter by twenty, he knew what size the ripe fruit would be.

Dr. Yeager has high hopes in this pumpkin hanging high in the University greenhouse. It is not very tasty. But it has seeds without coatings — a handy feature if you like to nibble on such nutritious seeds but get tired cracking their shells. It is being crossed with a high-quality squash. Object of this matrimony is a hybrid squash good for cooking, and with naked seeds one can eat like peanuts — no need to crack them.

At the end, it is the public that judges whether a new tomato will be a success or not. For instance, Yeager points out, there is little interest in a tomato that is not red. Yellow ones are still unusual and pink ones distinctly unpopular. Actually, he explains, red and pink varieties are brothers under the skin. The flesh in both is red. What makes the red tomato look red is its orange-colored skin. The pink tomato's pinkness is due to a transparent skin.

Producing redness is only a minor problem. Yeager's big work concerns earlier and higher-vitamin tomatoes. He got extreme earliness by pioneering with "determinate" varieties, of which Victor is the best-known example. Here, again, is the principle of reducing useless foliage growth. Such varieties "prune themselves" They behave like true annuals, reaching a certain height, and then stopping growth, instead of producing more and more branches and blossom clusters. As a result, they fruit earlier and, lacking sprawling habits, they do not need staking.

The work with high-vitamin tomatoes not only has looming economic importance, but illustrates the large amount of patient breeding that can accumulate in the background before a new variety makes its debut. Many crossings result in what Yeager calls his "mules" — hybrids that do not reproduce.

In the past the American Medical Association has classed tomato juice far below (Continued on page 218)

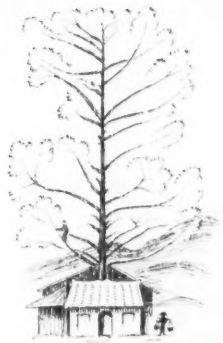
Coast and Dawn Redwoods

By EDWARD C. DAY

When universities, scientific organizations and publishers sent expeditions to the rugged interior of China to study a certain tree, heretofore known only in its fossil state, we await news of their discoveries with eager, appreciative interest.

Finally the explorers returned, bringing back seeds and samples of the mysterious tree, together with information on its habitat, growth and the various uses of the wood for building houses, boats and implements on the farm. The story of the trip was one of high and slippery adventure, discomforts endured, humorous episodes, providential delays and talks through interpreters to make plain their mission. It is a narrative of ready counsel given, wise provision made, little courtesies extended and of the friendly, human touch that worked gospel wonders all along the tough and hazardous way. Ambassador, schoolmaster, missionary, coolie, colonel and village chief each contributed by word and deed to the success of the expedition. And the explorers came back with material to study and a story to tell about the religious folk who worship God at the base of a primeval redwood tree.

The tree is a conifer with cones like those on our Pacific Coast redwood, but it sheds all its needles annually, appearing in winter as bare as a poplar. It has been called the Dawn Redwood, because the genus has flourished in remote regions of Szechuan and Hupeh provinces without interruption from Cretaceous time to the present, through many millions of years. The tree rises from a massive base to a height of a hundred feet; has ascending limbs, and a spreading crown; attains an estimated age of five hundred years. Three specimens of the Dawn Redwood were found growing beside the rice paddies at Mo-Tao-Chi; farther south, a stand of about a thousand trees was located in a valley and extending up the mountain slopes near the village of Shui-Hsa-Pa—place of the water-pine. Like our coast redwood, the Chinese tree grows best where there is abundant moisture.



The Dawn redwood and its foliage and cones.

The Dawn Redwood goes by the name *Metasequoia glyptostroboides*. The Pacific Coast redwood was called *Sequoia* in tribute to the Cherokee chief who invented an alphabet for his tribe. There are but two American species, the common redwood *S. sempervirens* along the coast, and *S. gigantea*, or Big Tree, of the Sierra. When fossil redwoods were discovered, with foliage and cones similar to that of *Sequoia sempervirens*, except that the needles were arranged in opposite pairs instead of alternately along the stem, the genus *Metasequoia* was coined to include them. *Meta*, in Greek, is a prefix denoting "after" or "following"; the specific term *glyptostroboides*, is from *glyptos* meaning sculptured, and *strobos*, a cone. Fossil redwoods have been discovered in China, Japan, the Pacific Northwest and across Eurasia, and have been named *M. chinensis*, *M. japonica*, *M. heeri*, and others. Then, when the conifer flourishing in the heart of China was found to have an opposite arrangement of needles the same as on the fossil genus, it was forthwith assigned to *Metasequoia* and, by reason of the sculptured character of the cones, was given the specific name *glyptostroboides*.

The Coast redwood, its foliage, cones and detail.

When redwood cones are green, the scales are pressed tightly together, exhibiting a mere line of demarcation between adjacent scales; but when mature the scales separate and the intervening grooves are seen crowded with seeds. The *Sequoia* seed is brown in color, heart-shaped to triangular in out-

line and about an eighth of an inch in size. The *Metasequoia* seed is a small, wafer-like disk resembling a flake of rolled oats, cream to sepia in color and measuring five mm. in diameter. The thin outer part of the disk is the wing; the swollen center, the germinative part of the seed. Viable seeds, planted in moist, sandy loam, germinate in three or four weeks.

Through the kindness of Jack Spring of Golden Gate Park Nursery, I was shown seedlings of both the Dawn and Coast redwoods grown from seed since the beginning of the year: the Coast redwood seed was planted on January 15; the Dawn seed, on February 19. Although the Dawn seed was started a month later than that of the Coast redwood, it proved to be the faster growing of the two, and by June equalled the latter seedling in height and number of branches. The California seedling is more erect in appearance with shorter needles arranged alternately on the stem, while the Chinese seedling is more lax and spreading, with longer and broader needles set in opposite pairs along the mid-rib of the leaf. The foilage of *Sequoia* is a darker shade of green, needles and stem being tinged with red, whereas the needles of *Metasequoia* are bright grass-green and the stem is a sepia hue. A paired arrangement of leaves is evidently more primitive than an alternate one. The California seedling starts out with a paired arrangement of the lowermost leaves, but higher up on the stem the alternate plan prevails. On the Chinese seedling the paired condition persists for leaves and needles alike out to the tip of every branch. This paired arrangement also obtains for the scales on the cone and the staminate catkins distributed along the terminal twigs.

Through courtesy of loan exhibits to both the Marin Art and Garden Show and the California Academy of Sciences, it has been possible to examine and study fossil cones and leaf sprays; and seeds, cones, foliage and sections of logs of both *Metasequoia* and *Sequoia* from the University. The fossils are from the John Day Basin of eastern Oregon, where stands of *Metasequoia* and birch became extinct through volcanic eruption about thirty million years ago. The cones must have been green when buried, because they are well preserved and show fine lines of demarcation of the oppositely placed scales; some of the leaves show needles almost entirely intact. The cross-sections of the Dawn and Coast redwoods are both about ten inches in diameter, taken at approximately the same level fifteen feet from the ground. The Dawn block came from a tree cut down a year ago by villagers at Shui-Hsa-Pa, and the Coast section from a tree recently cut down in Berkeley. There were nearly twice as many rings on the former as on the latter block, indicating that the *Sequoia sempervirens* was the faster growing tree. Its growth, however, was not as even and symmetrical as that of *Metasequoia*. Spreading of rings on one side and their compression on the opposite, suggested vicissitudes of exposure and growth to which the California tree had been subjected, in contrast to a greater uniformity of climatic conditions prevailing at Shui-Hsa-Pa. The bark of the Dawn Redwood is thinner and smoother than that of *Sequoia*, and the wood is of a lighter color. The wood of both trees was darkened by exposure to sunlight, as revealed when strips bearing the labels were removed.

The material in these neatly arranged, instructive exhibits was brought back by Dr. Ralph W. Chaney of the Department of Paleobotany at the University of California, and Dr. Milton Silverman, science writer for the *San Francisco Chronicle*, who made a flying trip together early in 1948 to study the Chinese redwood in its native habitat.

Tree in Light

By DANIEL SMYTHE

In the long night there is no mark
To show how oak-leaves swim the dark.
A silhouette of shadow stands;
It has the star-shine on its hands.
And supple winds of unknown space
Are like thin veils upon its face.
With the beginning of the day
That pulls the light of stars away,
The covers of the dark furl back,
And branches are no longer black.
The tree is cheerful and like one
Who wants to catch the stroke of sun.
At last, when light of dawn floods through,
Each separate leaf floats into view.
Its beauty in the sun is such
That we, too, want to feel its touch.
As it breaks further to the light,
We also move out of the night.

The Bull Snake — A Super Pet

By GEORGE McCLELLAN BRADT

Photographs by the Author

SNAKES have figured so vividly in the prejudiced imagination of mankind, from the time of Genesis to the present, that it is somewhat surprising to find that many people, perfectly normal in all other respects, have made highly interesting if somewhat unorthodox pets of these reptiles.

While many different kinds of snakes are kept in captivity — from the Hindu fakir's cobra to the Tattooed Lady's boa — few species make as satisfactory pets as do the common bull snakes of the United States. These handsome reptiles, found throughout the Great Plains and westward, are closely related to the pine snakes of the Atlantic and eastern Gulf region, and to the gopher snakes of the Pacific area. With them they make up the widely distributed genus *Pituophis*.

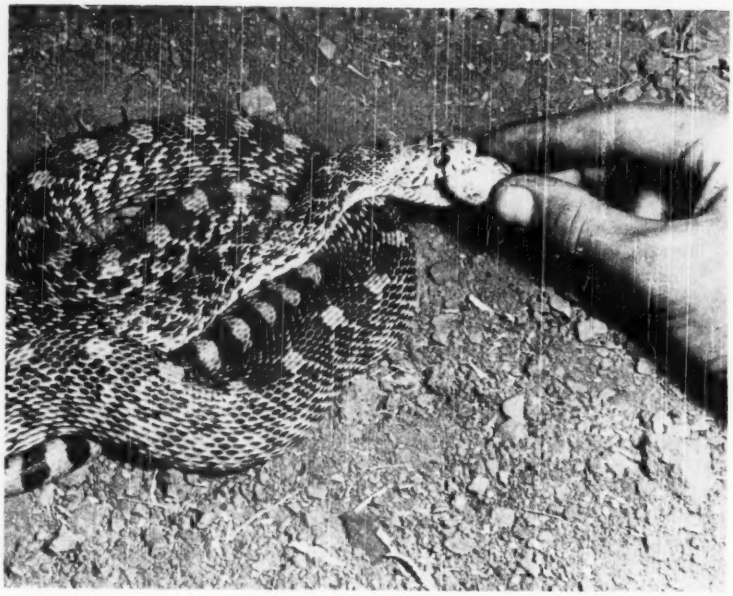
Bull snakes are frequently encountered crossing highways and country roads, or under rock piles near cultivated fields. When first cornered they will almost invariably hiss loudly and strike, but after a relatively short time in captivity they become exceedingly tame and gentle. If placed in a dry, roomy box, and fed and watered regularly, pet bull snakes make admirable subjects for the observation and study of the habits and behavior of one of the world's most amazing groups of animals.

Snakes really do make fine pets. Their skin is clean and dry and beautifully marked. Many who have made pets of them have proved that fear of snakes is not instinctive but handed on by parents or other snake-fearers. Lupe, one of the author's students, admires a beautiful bull snake.

Portrait of *Pituophis*, the bull snake. The round pupil in his eye indicates that it is a day-active snake. Nocturnal species have vertical pupils. The horny tail terminal of the snake seems to have no purpose.

During the course of our Nature work — photographing and observing wildlife, maintaining a school zoo, and collecting insects and reptiles for the American Museum of Natural History — my wife and I have tamed and studied a dozen or more of these fine snakes. And, from our first one to our latest, our associations with them have been thrilling.

Our introduction to the bull snake tribe was an experience we shall never forget. We had discovered, at the base of a large clump of mesquite, the occupied burrow of a pair of western burrowing owls. As we peered into the gaping mouth of their subterranean home, trying to summon ambition enough to begin digging under a hot June sun, an almost inaudible scraping sound reached our ears from deep within the burrow. A few seconds later a small, partially feathered baby burrowing owl came staggering up the incline toward the light. Here, we thought, was a fine opportunity to photograph a young owl without having



Some snakes become so tame that they can be fed by hand. This one would glide across its cage whenever it saw a hand with food.

to dig for it. Just as the fuzzy brown ball came within reach, however, and almost as if it had read our minds, the little fellow stopped suddenly in its tracks.

It had not stopped of its own volition, however. Far from it! As we watched, something smooth and round and yellow, with reddish-brown blotches, flashed in the dim passageway. In a split second two bright coils enveloped the helpless owlet in a scaly embrace from which there was no escape. The next moment the powerful coils contracted and crushed the life from the body of the hapless little bird. Only then did the owl's assassin show its face — that of a large bull snake.

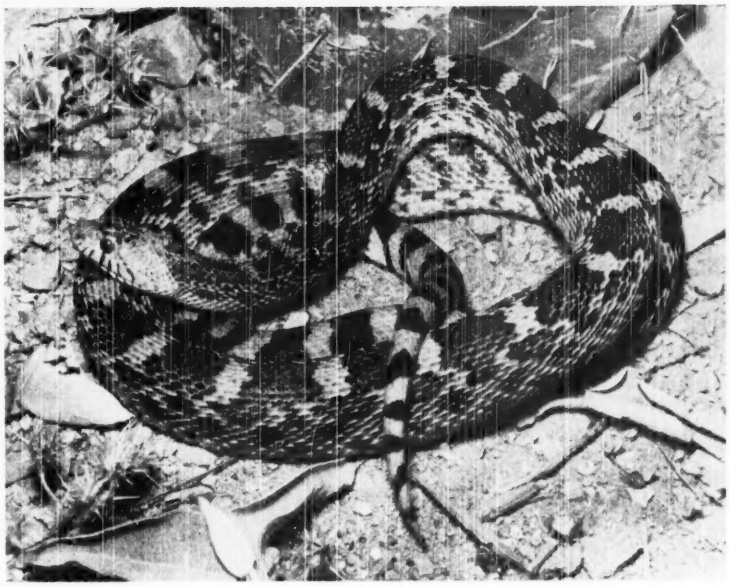
Motionless we watched this strange, seldom-witnessed, desert drama. The snake apparently had not noticed us, for it unconcernedly began investigating its victim's body, nuzzling the soft feathers like a bird dog. When it finally found the head it commenced swallowing the still warm owl. The entire meal was engulfed in less than five minutes, in spite of the fact that the diameter of the owl's body several times exceeded that of the bull snake's head. The owl's small round head disappeared first, then the body with the short wings flat against the sides, and finally the owl's bluish feet. After a few sidewise bendings of its body, to force the food into its stomach, the snake turned in the narrow burrow and glided out of sight into the earth probably to look for more owlets in the nest cavity below.

From this and subsequent individuals we learned at first hand much about the care and feeding, skin-shedding, and mating habits of these snakes. We augmented our own observations with those of various authorities, and found the following books particularly helpful: *Snakes Alive* by Clifford Pope; Roger Conant's *Reptiles of the New England States; Reptiles of North America*, by Raymond Ditmars; Schmidt's and Davis' *Field Book of the Snakes of the United States and Canada;* and *The Book of Wild Pets*, by Clifford B. Moore.

The best way to acquire a bull snake for a pet is, of course, to locate and capture it yourself. But if you live in a city, or for other reasons find it impractical to go snake-hunting, you can purchase your pet from any one of a number of wild animal dealers. Ross Allen of Silver Springs, Florida, for example, can probably supply you with a four- or five-foot bull snake. Specially built terrariums, with lids for housing snakes, can be purchased from the same source.

Bull snakes, fortunately, are not finicky as to diet. While all snakes have prodigious appetities, and will eat almost as much as you give them, a weekly meal is usually sufficient unless your pet is a particularly large specimen. Although snakes normally eat only live prey, we have had several bull snakes that would not hesitate to take dead rodents.

But whatever the food and however secured, the snake's swallowing performance will be a source of much interest and wonder as long as you keep your pet. As soon as the snake has seized its prey and killed it with a constricting coil or two it begins swallowing it head first. As snakes have no means of tearing apart their food, they must swallow it whole. And as the size of the intended meal often greatly exceeds the diameter of the snake's own head, the ingestion of such large repasts has necessitated a marvelous degree of physical adaptation. A snake's head is actually a complex system of movable bones designed to enable it to engulf just such large prey. Certain bones permit a lateral movement, which enlarges the mouth opening to several times its normal size. And both jaws are divided in half lengthwise so that the four parts move independently of each other. As numerous rearward-pointing teeth hold the food securely the snake literally crawls over its meal. The movable jaw bones are pushed forward in rotation and the prey is held by the teeth while the snake pulls itself over its food. The whole swallowing process may take anywhere from a few minutes to several hours, depending on the size of the meal.



The bull snake is high on the list of beneficial snakes, serving the farmer as a fine ratter. Progressive farmers might well gather bull snakes to release on their farms.

An interesting variation is to feed your pet by hand. Usually it will take the food gently in its mouth and then try to pull it from your fingers, although sometimes it may hiss and strike the proffered meal. We had one snake that would glide across its cage to take one sparrow egg after another from our fingers without breaking a single egg.

Although a snake can go a long time without food — several months, in fact — it is important to remember that it must have water regularly. A shallow dish embedded in the sand of the cage's floor will do. When a snake drinks its throat works in and out like a pair of bellows.

If your wife or mother has not made you "throw that horrible thing away," you will in time notice with surprise that your snake's eyes have suddenly become almost opaque and quite milky-looking. Do not be alarmed. Your pet is not sick, it is merely getting ready to shed its skin. A snake moults, or sheds its skin, every month or two during spring, summer and fall. Of course, it has grown a shiny new layer before it discards the old one.

Although the snake is actually blind during this period, its eyes will clear again in from five to ten days. The skin-shedding itself, however, will not take place until from two to four, or even more, days later. At the end of this time the old skin begins to loosen about the head, and the snake, by rubbing itself against rocks and bushes, gradually works the old, dry skin backwards and off. The skin is turned inside out in the process and is entire except for the mouth and anal openings. Even the lens-like eye scale is preserved. An examination of the skin will often tell the snake's species, although its actual length would be about ten percent less than the skin's length.

To aid the snake in this critical shedding process a rough rock or two must be placed in the cage when you see that your pet is about to "change its shirt," as the Mexicans put it. Otherwise the snake would find it almost impossible to rid itself of its old skin. If you do not believe this try wriggling out of a wet bathing suit "no hands!"

Two more interesting events in the life of your bull snake will be its mating and egg laying. If your pet happens to be a female acquired directly from the wild state it is possible that she will in time present you with from ten to eighteen soft, white eggs. If these are carefully placed in a receptacle filled with clean sawdust, which is moistened occasionally and kept at a temperature of about seventy degrees, they should hatch sometime during the early fall.

If you have two snakes of different sex and keep a rather constant watch you may even see their mating performance. This consists mainly of the male pursuing the female round and round the cage, with occasional periods of rest during which the male rubs his sensitive chin scales over the female's head. It is generally a long drawn out affair, but one well worth the necessary patience. We once sat for three and one-half hours almost without moving in order to observe and photograph their interesting behavior.

As the logical finale to a photographic series on the varied activity of our bull snake pets would have been the laying and subsequent hatching of a clutch of eggs, we were particularly solicitious about the well-being of our last bull snake — one which we had good reason to believe was definitely "with egg." When we had occasion to take a week's trip away from home we took our pet with us in order to care for it properly. The first night out we stopped at a large hotel, which will remain unnamed for obvious reasons, and knowing that the snake would get too hot if locked up in the car we smuggled cage and all up to our cool room. Everything went well until the next morning when we started to pack and found to our horror that the cage was empty. During the night the snake had somehow escaped and was then on its own as an uninvited guest of the hotel. After a frantic but unproductive search showed

us that our pet was no longer with us, and knowing that we would start a panic if we announced our loss, we "silently stole away," fervently hoping that no future guest would open a dresser drawer to be greeted by a large live bull snake or a dozen baby ones. Our only consolation is that, since the hotel had a large number of rodent guests, our pet would be well fed, and at the same time the hotel would profit by the acquisition of an expert "mouser," whether they ever became aware of its presence or not. We have never gone back.

★

Beach Plum

By LALIA MITCHELL THORNTON

Lacking the sweetness of the sun,
  Lacking the saltness of the sea,
Shaken by winds, by fogs undone,
  Borne on a low and scraggled tree.
Its acid fruit is small and dry,
Yet makes a most delicious pie.

★

Two trumpeter swans, painted for the duck stamp by Walter A. Weber, wing over Red Rock Lakes Refuge, in Montana, where the bird is slowly growing in numbers.

Trumpeter Swans Fly on 1950 Duck Stamp

★

Judges Albert M. Day, R. W. Westwood, Mike Hudoba, Congressman Clark W. Thompson, Bob Wilson and J. Hammond Brown display the winning design.

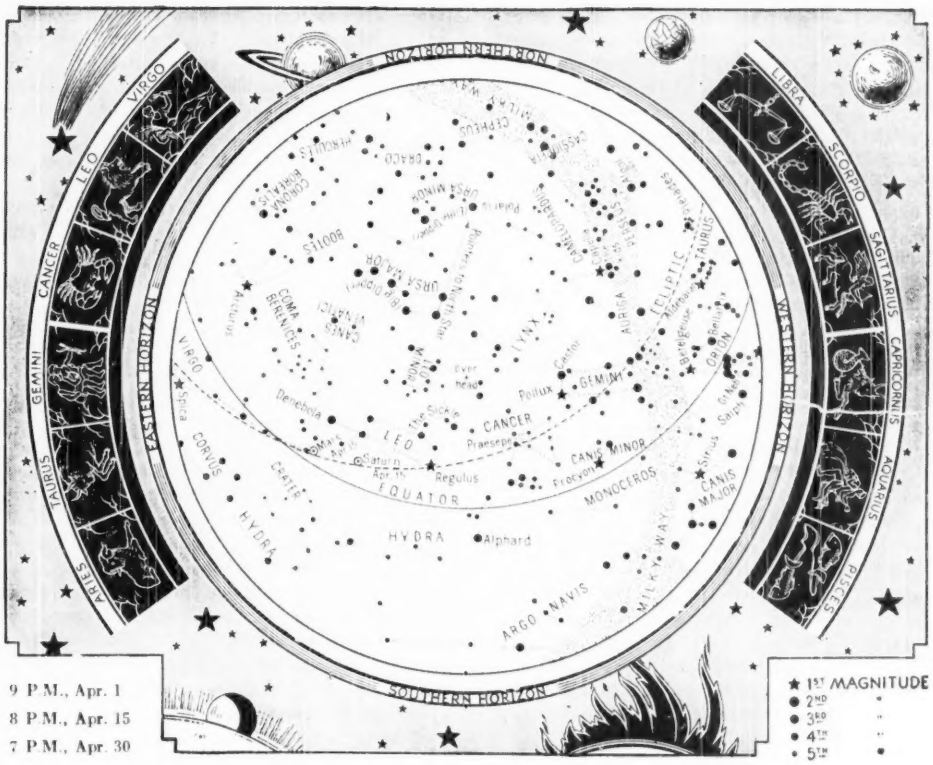
CONFRONTED by eighty-eight designs, displayed anonymously, a group of judges, including regional directors and other officials of the Fish and Wildlife Service and several wildlife authorities and conservationists, pondered and studied. Finally and separately they wrote their first, second and third choices on slips of paper and turned them in. A first choice was weighted three points; second two points; third one point. When the points were added the design showing two trumpeter swans against the background of Red Rock Lakes Wildlife Refuge in Montana had run away with the voting.

Thus was the selection made for the 1950 Migratory Waterfowl Hunting Stamp — usually called the Duck Stamp. The winning design was taken from the frame that concealed the name of the artist, and there was inscribed the signature of Walter A. Weber, who became the first to have designed two duck stamps. His painting of white-fronted geese was chosen in 1944. Second place in the voting went to a fine painting of two blue-winged teals, the work of A. H. Shortt, and third to J. Laurence Murray for his picture of three pintails.

This is the first time that a picture of a protected bird has appeared on the stamp. It should serve to focus attention on a bird that came perilously close to disappearing from our avifauna, and one that, today, is still too few in numbers. In 1935 there were only 73 known trumpeters in the United States. Through protection at Red Rock Lakes, and by the National Park Service in Yellowstone Park and vicinity, the number of birds had reached a population of 451 in 1949.

This was the first year that the competition has been open to all artists, professional and amateur. In the past leading waterfowl artists had been invited to submit designs, and selection was made from this limited group. The general invitation brought designs from 65 contestants, and from twenty-five States, the District of Columbia and Canada. All designs conforming to the specifications issued were treated with complete impartiality.

The law requires that the stamp be affixed to every license issued for the shooting of migratory waterfowl. The cost of the stamp is two dollars, having been increased from one dollar by act of the 1949 session of Congress. Funds derived from the sale of the stamps are used to acquire refuges and to administer and enforce the law and the annual waterfowl hunting rules.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

The Sun's Nearest Neighbors

By ISABEL M. LEWIS

In the August, 1949, issue of *The Griffith Observer*, published by the Griffith Observatory in Los Angeles, California, an interesting table is presented. This lists and gives much information concerning the forty stars nearest to the earth, exclusive of our own sun, which is the star nearest to us. This table was compiled largely from information contained in an article and table appearing in the *Publications of the Astronomical Society of the Pacific* for February, 1945. That article was entitled "Stars Nearer Than Five Parsecs," and was written by Dr. Peter Van De Kamp, Director of the Sproul Observatory of Swarthmore College. The distance of five parsecs corresponds to about 16½ light years, as a parsec is 3.26 light years, the distance at which the parallax of a star is one second of arc. No star is within that distance of the earth, so far as is known. It is equivalent to about twenty trillion miles. The original list contained thirty-nine stars, including the sun. The later list omits the sun and adds two more faint, nearby stars, giving forty stars in all within approximately 16½ light years, or about 100 trillion miles, of the sun.

The most remarkable fact about this list of forty stars is the large number of faint, red, dwarf stars that it contains. As some of the forty stars represent double or multiple star systems, there are fifty-three individual stars in the list, and of this number thirty-three are faint, red, dwarf stars. Nine are orange-colored stars. With few exceptions the red dwarf stars listed are very feebly luminous. The brightest of them has a luminosity that is only thirty-three thousandths that of our own sun. The faintest shines so feebly that it would take 50,000 stars equal to it in brightness to give as much light as the sun. Between these two extremes

the red dwarfs among these stars shine more or less feebly. Half of them do not have even one-thousandth of the brightness of our sun.

Four stars only in this list of the forty nearest stars are intrinsically brighter than our own sun. They are Alpha Centauri, Sirius, Procyon, and Altair. The nearest known star is Alpha Centauri at a distance of 4.3 light years. It is a triple star consisting of a close double and a third very faint star. The combined light of the two bright stars is about equal to that of Vega. Sirius with its remarkable dense, white, dwarf companion star is at a distance of 8.6 light years. It is a brilliant, white, hydrogen star. Alpha Centauri is a yellowish star of nearly the same type as our own sun. Procyon is a yellowish-white calcium star. The lines of calcium are conspicuously present in its spectrum, and it has a faint companion star. Its distance from the earth is eleven light years. Altair is a white, first magnitude, hydrogen star at a distance of 15.7 light years, and is intrinsically two and one-half times more luminous than the sun. It is the only one of the four stars brighter than the sun that is not a member of a double or multiple star system. It is a remarkable fact that among these stars so near to the sun at least one out of every three belongs to a system of two or more stars in revolution about a common center of gravity. The four stars that are nearest to the sun are all members of double or multiple star systems, our own sun being, in its own immediate stellar neighborhood, exceptional in not having a companion star.

During the past year, and at the present time, red, dwarf stars near the sun are receiving much attention. One-third of the faint, red, dwarf stars that are among the forty nearest stars have what is known as emission lines in their spectra of hydrogen, and in some instances calcium as well. The spectrum of a star usually shows a number of fine, dark lines called absorption lines. These are due to absorption by cooler gases in the atmosphere of the star of the hotter gases of the same elements at the surface of the star beneath. In some instances, however, gases in the atmosphere of the star, or surrounding it, *emit* instead of *absorb* radiations, and the lines in the spectrum belonging to those elements then appear as bright lines, or emission lines. In dwarf, red stars near the earth these emission lines are associated with variability in the light of the star.

About a year ago Dr. W. J. Luyten of the University of Minnesota discovered some remarkable facts about a faint red star with bright lines through the measurement of images of the star on photographic plates obtained at the University of Arizona. This star, now called L-726-8, in which the L stands for Luyten, was found to be probably nearer to the earth than any other star except the Alpha Centauri system, and also it was found that its motion across the line of sight, known as proper motion, was greater than that of any other known star. The star with the greatest known proper motion up to that time was Barnard's star. The distance of this star from the earth is 6.1 light years, that of the star L-726-8 is 5.8 light years. The difference in distance of the two stars from the earth is so slight it is possible more accurate measurements may change their relative distances.

Star L-726-8 has been found to be a double star, very red and so faint that our sun gives 40,000 times as much light as the brighter of the pair, and 60,000 times as much light as the fainter of the two stars. The most remarkable fact discovered in regard to this star, however, is that it is subject to sudden very brief flares of an explosive nature. These last for only a few minutes and apparently are connected with the production of bright emission lines of hydrogen and calcium in the spectrum of the star. On two occasions, in December, 1948, flares were observed in the very faint variable companion star. On one occasion the star suddenly flared up to twelve times its normal brightness and then returned to its usual brightness in a period of only twenty minutes. On the second occasion the star increased ten times in brightness within six minutes and in the next few minutes dropped to six times its normal brightness.

There are, up to the present time, records of the observance of similar phenomena in the case of five different stars. Sudden flare-ups of these dwarf Me stars, as they are called, — that is, red stars of type known as M with bright emission lines — are now being made a subject of special study. Of unusual interest in this connection are the observations made on the night of April 30, 1949, by Dr. and Mrs. Gerald E. Kron of the Lick Observatory. The sudden outburst of a dwarf, red star that was not double was observed at a time when some routine photo-electric measurements of the light of this star were being made. Within a period of nine minutes a rapid variation in the radiations of this star took place. It appeared probable that the flare-up arose from intense heating of a small area at the surface of the star. So rapid was the cooling that no great mass of matter was necessarily involved. This star, which is one of the forty nearest stars, at a distance of 15.5 light years from the earth, has a diameter about two-thirds that of our sun. Solar flares occur on our own sun but on a small scale compared to the explosive violence of the outbursts on these small, red, dwarf stars near the earth. The surface temperatures of the red dwarfs is of the order of 3000 degrees Absolute, or less, and they are the coolest of all stars. The cause of their sudden and frequent explosions is not understood, but appears to be closely associated with the intense radiations of hydrogen and calcium in these stars.

(Continued on page 218)

That Night He Read

By EDWARD D. GARNER

That night he read the lucid text of stars,
And as he thoughtfully their great truths conned,
He saw they were a preface to what lay
In richer prose, in mightier works, beyond.

The School Page

By E. LAURENCE PALMER

Professor of Nature and Science, Education, Cornell University, and Director of Nature Education, The American Nature Association.

Third Grade Nature Study Early in the Century

IT IS interesting that at about the same time that the president of the National Association of Biology Teachers asked that I write the article appearing on page 216 in this magazine on early high school biology, as I saw it, another regular reader of this page asked definitely that I record my experiences in the third grade, for what they may be worth. To be exact, so far as our title is concerned we must admit that this goes back a couple of years into the last century, but that does not change the story too seriously.

If there is anything to the rule that if you spare the rod you spoil the child I rather think I proved it in the third grade. I do not think that the rule used on my bare hands had anything to do with my getting the most out of that third grade from the best teacher I ever had before I came to college. It is true that the only licking I ever got in school I got from that teacher. I got it, not for failing to study, or for doing anything of a serious nature. Rather I got it for looking up from my book and grinning at Margaret Turner, who, with me, had been kept after school for some long-forgotten reason. It is funny to think now of getting licked for grinning at a girl, but those are the facts.

The first half of that third year I had as a teacher the late Mrs. John Mumford Keese, who had married a doctor, who later practiced in Syracuse, New York. I do not remember ever seeing her since she taught me, but just before she died she sent me one of the books she used to read to us in that class. She taught me, among other things, a love of Kipling, a love of good poetry, and, above all, a love of Nature and a realization that for much of what we found in books we could frequently find supporting evidence in the world of reality. I would not have dared be late to Mrs. Keese's class because she made a practice of reading the "Jungle Books," and various bits of poetry to us, if the class was on time and behaved as it should. Fortunately for us Mrs. Keese had just been married and was to leave the teaching field at the end of the term. I rather think that, under the circumstances, she was not unduly concerned about state regulations as to what she should teach.

Somehow Mrs. Keese got hold of copies of some of the first Cornell bulletins on Nature Study written for children. I remember seven of them very well and a few less well. One of these was the controversial leaflet by L. H. Bailey on "How a Squash Plant Gets Out of Its Seed." We planted squash seeds. We found that the book was right in what it told us. Another leaflet was Cavanaugh's "How a Candle Burns." I smoked chimneys at home after I had seen the experiment demonstrated in school, and I did what the leaflet suggested should be done. I tried to follow Bailey's story of "Four Apple Twigs," but the detail was a bit beyond my third grade ability to see small things. Mrs. Comstock's "Some Tent Makers" was the first of the bulletins that I saw. I can still remember the thrill of finding tent caterpillar eggs on our Astrachan tree and of taking them to school. There the eggs hatched on a twig that was supplied with water from an ink bottle. I remember that we used an ink bottle because that was the way it was shown in the leaflet. We did arithmetic lessons from what we saw these tent caterpillars do, and I think it was worth more than all of the arithmetic drill we had the second half of that year. We got a copy of Mrs. Comstock's "Hints on Making Collections of Insects" and I made a collecting net, a cyanide jar, and a great host of insect boxes from modified cigar boxes. The two top shelves of our harness room were at one time filled with boxes of mounted and probably poorly named insects. The beetles had pins through the proper wing covers, however, and the butterfly wings were carefully and properly spread. The only other leaflets in this series that approached the insect collecting and caterpillar numbers were one by Gage on the "Life History of the Toad," and Mary Roger's "Life in an Aquarium." Every direction, and almost every statement in these leaflets, was verified from life found in a pond to the rear of our house.

It is strange to think that one half-year of school, four percent of the total pre-college experience, should have opened up so many worthwhile channels of work to me as did that spring term with Mrs. Keese, Kipling, Comstock, Bailey, Gage and Rogers. They were a hard combination to beat, and when I think that all they represented were thrown out of the window the second half of my third year in favor of the dry tables in Milne's Arithmetic, I rather think I can understand some of the resentments against school that developed from that point on for the next decade. Certainly we were not hitting on high again for a long, long while.

Never did I meet a backswimmer or a water boatman again in a classroom until I was doing some graduate work under Dr. J. G. Needham. Then it all came back to me, and I have been poking and exploring ponds more or less ever since. I remember that during the "dark ages" following my experiences with Mrs. Keese that I found some satisfaction in being able to name, with some confidence, some of the critters I found in the innards of trout when I cleaned them. My Dad used to think I was crazy to spend my time looking at such things, but he had never had the opportunity for such profound studies as I had had the first half of my third year in school, and he had never seen the gems from the pens of Comstock, Bailey, Gage and Rogers.

I know that Mrs. Keese, in introducing us to the animal world about us, and to the animal world of India, as pictured by Kipling, did me a distinct service and I got *The Jungle Book* the first Christmas after that year. I could not read it all, but I made a grand try at it, and Mowgli and all his friends and enemies were my friends and enemies as well. A few years later Seton wrote, in *The Ladies Home Journal*, his story of "Two Little Savages," and then we had the beginning of the stories that later became his *Wild Animals I Have Known* and *Lives of the Hunted*. I still have all three of those books and remember with surprise how, on one Christmas morning, I read *Lives of the Hunted* from cover to cover before lunch time. It may be that I would have read those stories anyway, but I have my doubts about it. While my eyesight might now be better had I used my eyes more intelligently in those days, yet I do not regret for a moment anything I got as a result of the stimulus of that part of my school experience.

It is strange that, while the first half of that school year with Mrs. Keese bristles with fine memories, the only recollections I have of the next half is associated with tables in an arithmetic and long hours at night beside an oil lamp doing endless problems because we had to do them, not because we wanted to do so. While my memories of Mrs. Keese are a bit mixed because she and her new husband supplied us youngsters with good subject matter for the type of spying that goes with kids of that age, nevertheless the real things I remember about her were the fine things that went on in that classroom of hers. There I learned things in a way that made me later fail to be impressed with much of the project method, activities programs and progressive education ideas that were to come.

It may be that I learned to add under Miss Conable, but I did not learn to like poetry under her. And if I had to give up any excellence I may have in mathematics for any of the enjoyment I get from poetry and from Nature in general I do not think I would hesitate long in making a decision.

Camera Trails

By EDNA HOFFMAN EVANS

THE camera does not lie. That old saying is a comforting one -- sometimes. It is comforting when the camera is particularly kind to us, when it shows us at our best as camera subjects, or when it brings out the particular object that we, as camera operators, have desired to emphasize.

But at other times, when it shows all our freckles and wrinkles, when poorly arranged shadows lengthen our noses or add a couple more chins to those we actually possess, we are inclined to doubt the veracity of our lens. Also, when the camera picks out some unimportant detail in the background or foreground and emphasizes it so that the whole picture is spoiled — there again we want to pick a quarrel with our prevaricating camera.

The human eye is much like a camera, but the human brain has a selective power that the camera lacks. When we look at a scene or a subject, we see that portion on which our eyes are focused. The background is there, but our brains are apt to sift out unwanted details. Thus we are often surprised, upon looking at a picture, to see distracting details that we never noticed in the original scene.

It takes a while actually to see a scene as a composition. The beginner simply aims at a central object and snaps his picture. The more experienced photographer looks before, behind, and at the sides of his subject, too. Thus, in the case of the latter's pictures, the background is subordinate to the center of interest and no startling details — such as branches that sprout antler-like from the subject's head — unexpectedly appear.

Foregrounds, too, can cause trouble. In Nature shots, grass blades, bushes, or twigs are apt to obtrude themselves across the foreground and blur the image on which the camera is focused. Often, they are scarcely noticeable in the ground glass or view finder. But in the finished picture — there they are, intrusive and unwelcome.

Another thing that can spoil a foreground is the photographer's own shadow, which thrusts itself blackly into the picture when he stands with the sun shining at a low angle over his shoulder Sometimes, by moving slightly, or even by kneeling, he can thwart his shadow. Once, I climbed down into a ditch and shot up from there in order to evade my own shadow; but in cases where an angle shot is not desirable, such subterfuges cannot be used. In shooting pictures away from the sun, watch that shadow of yours and try to keep it out of the picture.

Returning to the background. Nature pictures, especially action shots or those that must be taken when the opportunity presents itself, cannot always avoid unwanted background details. We will leave pictures of that type out of this discussion since there is little we can do about them, anway.

But not all Nature shots are taken on the spur of the moment. Many of them, possibly a majority of the good ones, are planned and plotted in advance. In setting up a camera in a blind, the photographer can check his background when he sets his focus. He can also check his foreground to make certain no leaves or blades of grass intrude across the path of view.

Suppose there is something undesirable in the background — what can the Nature photographer do about it?

First of all, he can move his camera. The final position, of course, depends on many things. But move he can — up, down, right, left, forward, or back. He may even be able to go around and try a setup from the opposite direction.

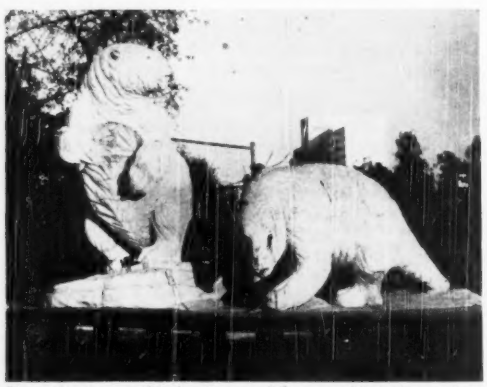
The pictures used this month are illustrations of how a different point of view can change the background. They show a pair of those giant ground sloths that once wandered over the area now occupied by metropolitan Los Angeles. The statues stand in the park that surrounds the La Brea asphalt pits, and they were one of the things I particularly wanted to see when I visited "L.A." Frankly, I was disappointed; but that is beside the point. We were discussing backgrounds and foregrounds, not the likes and dislikes of a loyal Floridian in California.

In the first picture the sloths show up as two distinct individuals; but look at their surroundings. A protective wooden railing obscures the foreground. In the background an ultra-modern "cliff dwelling" (apartment house) juts into the sky, while closer to the subjects is a twentieth century wire fence. What a setting for a couple of prehistoric creatures!

In order to take the second picture I moved a quarter of the way around the big concrete statues. I also moved closer, to blot out all but the top of the protective railing. True, a portion of it appears in front of the sloth's nose, but that could not be avoided. As for the background — the shrubs and low trees provide a much more natural setting than did the apartment house on the skyline.

Of course, if those sloths had been live animals, I might not have been able to maneuver so freely. The chances are, I would have done considerable thinking, and probably checked to see that my insurance premiums were paid up, before I ventured half that close. But a certain amount of maneuvering can be done, even with live subjects. If they refuse to cooperate or to remain quiet while you experiment, you can usually outguess them. Choose the most desirable background and then wait until they move in front of it. That takes patience, but often it will work.

And, before we go on, a word or two about the La Brea statues. Why is it that people just cannot seem to let well enough alone? Why smear tar on a statue (the smears are obvious in the picture). Why discard waste paper, tin cans, and similar junk in a park? Why mar something that has come down to us from time immemorial — like the asphalt pits themselves — with all



Note the impossible background for a prehistoric creature in the picture at the left. Obviously a change in camera location is necessary. By moving a quarter of the way around an improved and much more appropriate background can be achieved.

sorts of twentieth century litter? We photographers could at least put our empty film boxes, wrappers, torn-off tabs, and other rubbish in our pockets until we find a trash box. But, alas, not all of us do that.

Back to backgrounds again. Another way to avoid unpleasant ones is to correct the lighting. This is not always possible but sometimes the sun, itself, will provide a more effective backlighting effect than could be obtained with the most skillfully arranged spotlights.

A change in depth of focus often can blur, or even eliminate entirely, an unwanted background. To do this successfully, a camera must have a fairly high lens aperture. Bring the subject forward, as far as possible away from the unwanted background. Open the lens to its widest aperture and focus sharply on the subject, or even slightly ahead of the subject. The result is a diffused background that often successfully disguises unwanted details there. However, when the background consists chiefly of glossy, sunlit foliage, this does not always work. In this instance, the small, bright, out-of-focus areas will appear in the picture as white, circular spots.

Filters, too, can help overcome background troubles by altering the value of colors. Suppose you have a red flower against a green background. To the eye there is a marked contrast of colors, but on black-and-white film the red petals are reduced to the same value as the green leaves, and the entire picture is dark and lacking in contrast. Photographed through a red filter, the flower becomes light — almost white. With a green filter, the leaves appear much lighter than the flower. Yellow, orange, or red filters serve to darken the sky, if some light object is to be silhouetted against it.

Thus it is possible, in many ways, to alter a background so that it ceases to be a detracting element in a picture. Only experimentation and practice will bring the desired results; yet the pictorial qualities are much better when backgrounds are considered and the end is well worth the time and effort expended in obtaining it.

So, look before you snap. Clear away obstructions from the foreground and beware of objects you do not want in the background. Remember that the eye sees in three dimensions and with "mental reservations." The camera, on the other hand, sees everything as it is, without mental sifting. And, when everything is reduced to the flat two-dimensions of a photograph — the camera may be telling the absolute truth, but it is a truth that is definitely not desirable in an artistic photograph.

FROM THE MAIL BOX

While it may be a little past season to mention Christmas cards, I have received some interesting comments from the ones I sent out during the recent holidays. "Was the deer alive or stuffed?" was the most frequent query. And I always answered, "Definitely, it was alive. But it was stuffed, too; stuffed with all the potato chips, cookies, and grapes I fed it in order to persuade it to pose."

This Zeiss-Ikon camera, Contax-S, is the first reflex camera to provide life-size, eye-level focusing. A special view finder device "bends" the light rays as they pass through the lens.

But I think a librarian friend expressed my own feelings most aptly when she wrote: "It is nice to see someone feeding deer for a change, instead of shooting them."

Most of the trade mail this month has been concerned with new cameras, or with new developments for older models.

The Ercona Camera Corporation, 527 Fifth Avenue, New York 17, N. Y., American sales representative for Zeiss-Ikon of Dresden, Germany, has recently offered for sale a 35mm single-lens reflex camera, the Contax S. This camera's particular new feature is the Prisma-Scope view finder, an ingenious arrangement of prisms and mirror that conducts the image through the lens, bends, reflects, and finally throws it on a ground glass screen at eye level. The focal plane shutter is capable of speeds from one to 1/1000th second, while the built in flash synchronization has the contact located inside the tripod socket, allowing for the attachment of a simple and functional flash gun. Naturally, this camera is no beginner's model, and its price ($475 tax included) is in keeping with its versatility. Ercona Camera Corporation also has numerous other Zeiss-Ikon models.

Three other new cameras, also German-made, are coming from Agfa Camerawerk, Munich, in the American zone. They are the Ventura, a $35 folding camera; the Ventura Deluxe, a $49.50 folding camera, both taking twelve 2¼ x 2¼ pictures on 120 roll film; and the Karomat 36, a bellows-type miniature which will sell for $179.50. Some regional representatives for these imported camera already have been designated and others will be appointed soon. Watch for them in your favorite camera store.

HIGH SCHOOL BIOLOGY EARLY IN THE CENTURY

By E. LAURENCE PALMER

The president of the National Association of Biology Teachers has asked that I write something of early high school biology as I knew it from personal experience. I am electing to present on this page, and on The School Page, a picture of my early experiences in the biology field in the elementary schools and the secondary schools of New York State.

As a youngster practically all of my major interests in biology centered around hunting and fishing. Giving in to these interests, whenever possible, through my elementary school experience and years, set the stage for something worthwhile at the high school level. It is not surprising that when I had the chance to take biology I took it at the first opportunity. What is surprising is that I ever again took another course in the field. In my freshman year in college I took a course in botany, and at the end of the year swore I never again would take a course dealing with plants. In spite of my experiences in introductory biology courses in high school, I went on and majored for my doctorate in systematic botany. I wonder what influence introductory courses are having these days on the youngsters that submit to them?

But what about this high school biology? How did such a course fit into the needs of at least one youngster growing up in a small New York town early in the century? I wonder, sometimes, if I profited by the experience when I remember how I tried to teach Iowa farmers about oospores, zoospores and zygospores in their initial contacts with me as a teacher. The fact that we soon abandoned this study to develop an understanding of the routine of selection of seed corn, and to use some of the ideas I wanted to get over in attaining skills, indicates that my ideas were more sensible than were those of some of my early teachers.

But back in 1904, in Cortland, New York, I had heard that biology would help me understand living things. I had been intrigued by atrociously stuffed animals in the laboratory. I had gazed with awe and some repugnance at pickled specimens on the shelves, and I did not like the smell of that part of our school building. In spite of all this I entered that biology class with high hopes. They did not last long.

It was early September when I went into that class. Trout season had just closed. It had been a banner year for fishing and I could tell with some certainty the trout population of Dry Creek and Otter Creek. My best friend, the game warden, and I had had a bet of a trout fly on my total catch for the season, and I had fished late into the night of the last day to win that bet. It seemed to me that a course dealing with fish and other living things would somehow improve my skill for another year, so I was willing to give that course "the works." What a rude awakening I had.

As I remember it we started off with a consideration of the grasshopper, not as trout bait, or as a singer, or as a destroyer of crops, or a maker of history, or as survival food. Instead we used huge, pickled specimens the like of which never hopped the fields of Cortland County. My specimen lacked the kind of internal "workins" it should have had, so the professor suggested that I use the book to help me see what I should see. Actually I know now that my specimen had been parasitized by a hair worm, and could have been used to help me understand a problem the solution of which had been denied me in the fourth grade. Neither the professor nor I knew that. So I copied the picture in the book.

Later in the course we were asked to draw perfectly symmetrical crayfish, the like of which do not grow in Nature, and the anatomy of marine mollusks, the like of which were not to be found in our community. But finally we came to what I expected would be the high light of the course — the study of fishes.

I will never forget the day I walked into that laboratory, or the anger that boiled within me as the morning progressed. I admit it was a sight for sore eyes to see rows of aquaria swarming with beautiful fingerling brook trout. It was not pleasant to see them die as the temperature rose in the room along with my ire. And after the last fish had died it was not pleasant to learn the story of their capture.

The water works in Cortland was fed by huge springs. It was illegal to take fish from these springs as they served as a feeder to maintain the population of the creek they fed. Not only had these trout displayed in the laboratory been taken from posted territory but they were all under legal size. They had been taken in a net, out of season, had been kept in captivity. They all died with profit to no one, and there were plenty of witnesses to the facts of the case.

Our local game warden was one of the finest I have ever known. He had been compelled to fine heavily a man with a large family who had taken trout to feed his family without first buying a license. The warden knew the man was wrong, but recognized his desperate circumstances. He had wanted to give the man a severe warning and let him off, but had been forced by local pressure to levy the fine.

Naturally I shared my resentment of the laboratory experience with the warden. Naturally he followed it up, and naturally he did not inform on his informer. Great was the furor in school over the matter. The principal, who preached ethics to us at every opportunity, immediately rallied to the support of his subordinate. Because of certain official connections the teacher, who had no license, who had taken trout out of season, with an illegal net, under size, and out of season, got off scot free. In disgust the warden resigned, and a certain high school biology student became immediately as independent as the pickled earthworms he had been forced to study.

I remember practically nothing of the third of the course devoted in the winter months to the study of human biology, and little of the work in botany in the spring term, when I made my first serious herbarium, into which I put the rarest plants, thus making them rarer. The course as a whole was a dud and contributed nothing to my future interest in biology. Rather, it set me against such work, and had not the fields and streams of the neighborhood come through with some worthwhile experiences I doubt if I should have gone on with the subject.

The irony of the whole situation is that at the end of our year our biology teacher was fired from the faculty, and as a gesture of pseudoappreciation our class decided to give him something to remember us by, although it is doubtful if the fellow ever could forget that first term. The ridiculous aspect of the situation was complicated by the fact that I was selected to investigate the interests of the teacher and to select an appropriate gift. Not until then did I learn that he was not trained as a biology teacher at all. Instead he had been an English teacher out of a job. He had just accepted a job teaching biology because it happened to be available. I had read Thoreau's *Walden* repeatedly in the school library, and I selected a leather-bound copy as a gift for the English teacher who had had to teach biology. How I wish now he had stuck to his last and given at least some of the class a taste of Thoreau's appreciation of Nature!

The funny closing episode is that when, at chapel exercises, I presented this gift to the man who had just been fired, the poor fellow almost broke down and cried. In sympathy I almost joined him in the act. It must have been a good speech. Certainly there was nothing in the student-teacher relationship in that biology class that could have contributed to such emotion, and if the teacher had known who tipped off the game warden I wonder what the finale would have been. This is the first time I have told of this.

I wonder if we still, nearly a half-century later, do not find much of our high school biology equally unassociated with the interests of the children who study the subject?

Study the Desert

Cooperative study of the existing research and reclamation work being done in Near and Middle East desert areas has been undertaken through joint action of UNESCO, the *News Chronicle*, British Liberal daily, and *Picture Post*, an illustrated London weekly. Ritchie Calder, science editor of the newspaper, is going into the field with a photographer from the illustrated paper, covering Algiers, Tunisia, Tripolitania, Cyrenaica, Egypt, Iraq, Cyprus and Israel. In many areas rich in historical significance attempts are being made to recreate the economic wealth of the past through research and reclamation. Carthage and Babylon are two of these. Data will be gathered in experimental farming, soil erosion, reforestation and other phases of reclamation in often once rich areas.

Michigan Audubon Society

At its forty-sixth annual meeting in January the Michigan Audubon Society went emphatically on record for the protection of birds of prey in Michigan, and particularly decried the "present wanton destruction of the snowy owl." Another resolution urged the investigation of waterfowl in Michigan by qualified organizations. The conservation committee of the society, headed by Clarence Messner, endorsed heartily the Natural Areas project under the direction of the Michigan Botanical Club. This project would seek to preserve before it is too late typical areas throughout the State, valuable for their floral, faunal or geological features.

Southwest Monuments

The Southwestern Monuments Association, Box 2011, Santa Fe, New Mexico, is dedicated "to aid in the preservation and interpretation of Southwestern features of outstanding national interest." It is a non-profit organization with an educational purpose. To that end it has built up a bibliography of published Southwestern material and a library of Southwestern slides. Anyone interested may obtain a list of these materials.

Wanted! Dead or Alive. . .

Do you know of any freak trees — unusual in formation or in place of growth? Better still do you have or can you secure a photograph of a "woodland wonder"? If so, Glen P. Burns, 4736 West Forest Home Avenue, Milwaukee 15, Wisconsin, hobby collector of freak tree photos, solicits your cooperation in planning a booklet. For tracking down a "wanted" freak tree or sending forth clues of one's whereabouts, you shall be rewarded with a complimentary copy of the published work.

Butterfly Photographs

Ralph W. Macy, Professor of Biology at Reed College, Portland, Oregon, and co-author of the excellent book, *Butterflies*, published by the University of Minnesota Press, is at work on a new book on the biology of butterflies. While he has taken many butterfly pictures himself, he is interested in good photographs so that the book may be thoroughly illustrated and cover the widest geographical range. These photographs, either in color or black and white, may cover any phase in the life history of the butterfly, but should be of natural situations. Pictures can be received up to August 1, 1950, and those used will be paid for by the publisher and used with credit.

Wild Flower Guide

How to Know the Wild Flowers. By Alfred Stefferud. New York. 1950. Henry Holt and Company. 144 pages. Illustrated by Sidney H. Horn. $2.00.

This is a simple introductory guide to knowledge of wild flowers, intended for the individual who has not enjoyed a considerable background in botany but wishes to get acquainted with flowers of the field and woods. Some four hundred flowers are covered. Introductory pages present simple details of the composition of a flower, its leaves, roots and other information basic to identification. This basic information is carried through in the various groups considered. This is a handy pocket book to be carried along wherever one walks outdoors.

Huckleberry Mountain

For several years one of the features of the courses at the Huckleberry Mountain Workshop-Camp has been the work in Nature appreciation carried on by Mabel T. Rogers. This workshop-camp is a "non-profit educational institution for the creative arts," and Miss Rogers has planned her contribution to help writers and painters to an accurate presentation of Nature facts. While the regular session this year will start in late June, in response to requests a pre-season session will be held from June 2 to 15, and Miss Rogers will be on hand for this period, also. Full details from Florence W. Brewer, 20 Lookout Drive, Asheville, N. C.

PHANTOM ORCHID

(Continued from page 184)

there was not enough light for survival, so it went to the soil for predigested food.

There are about a dozen species in the genus, found around the world, but only this one is native to the Northwest. Others are found in Japan, the Caucasus, the Himalayas, temperate Asia, Greece, Mesopotamia, Persia, Sicily, Asia Minor, Europe, and North Africa.

The only plant likely to be confused with it in our territory is the Indian Pipe, but the two are easily distinguished. The Phantom Orchid turns brown when it is dying, while the Indian Pipe becomes almost black. While this rare orchid appears to be snow-white, beside a piece of white paper or cloth it is seen to be slightly cream-colored. The Indian Pipe is pure white. *Cephalanthera* blossoms a full two weeks ahead of the Indian Pipe, although both can be seen in flower at the same time. The plants appear in clumps of two or three, occasionally, but usually are alone. The Indian Pipe, however, flowers in clusters of from two to 150 stems, and rarely singly.

This orchid favors mountains at low altitudes, although it can be found in the valleys, all the way from Washington to California and eastward to Idaho. Portland is particularly fortunate in that a few of them are growing in deep shade in the Hoyt Arboretum. There are a few up Oneonta Gorge, about thirty-five miles east of Portland, if you know where to look. It is possible to see them as early as the middle of May, and three weeks later will generally find them at their prime.

Observations made of several dozen plants after they had matured showed little indication of seed. I found only two out of several dozen plants that had enlarged ovaries, and of those only one on each plant was swelling. The scarcity of seed may be one of the reasons for the extreme rarity of this plant.

The Sunday I located the seventy plants held other surprises. In a dense forest of second growth firs, were growing the striped and the spotted coral root, the leafless wintergreen, and nearly a dozen plants of the Indian Pipe — saphrophites all. Among them, in an area of less than five acres, bringing life and beauty and a marvelous richness to the deep shade, I gazed in wonder upon nearly five hundred more Phantom Orchids!

HE RACES TOMATOES

(Continued from page 204)

orange juice in vitamin C content. This is the vitamin known chemically as ascorbic acid, and, as everybody knows, is vital to our health.

After eleven years, Yeager has now created tomatoes with Vitamin C content that rivals that of citrus fruits, and is retained in the canned product. Amount of sunlight produces variations, but, in general, standard tomatoes contain around twenty milligrams of this vitamin per 100 grams. The new varieties run up to three times this amount, and have even reached 80 milligrams of Vitamin C per 100 grams.

This vitamin pioneering began in 1938, shortly after Yeager came to Durham. It started by crossing a greenhouse variety, Michigan State Forcing, with a wild tomato from Peru. The latter was worthless as far as the eye could tell. It was a sweet, greenish-white fruit only one inch in diameter. But Yeager knew that this grape-like variety's Vitamin C content was four times that of ordinary tomatoes.

From several hundred matings, many fruits were set. But the sum total of all that work was only one, solitary hybrid seed. It was this lone freak that Yeager planted nervously.

Luckily, it was fertile, and it produced enough fruit for a sizable second generation. This enabled the long job of more crossings and selection of best progeny to get underway. The first products, of course, were much too small. They lacked redness and good taste. Gradually, Yeager built size, quality and color into the newcomers.

Two years ago, he was ready with his first introduction. It is called High C. In addition to the vitamin feature, it has determinate growth for early ripening. It is round, red, very firm, but somewhat small — about five fruits to the pound. Highly productive in an average growing season, its Vitamin C content runs roughly double that of standards like Victor and Marglobe.

Last year, Yeager finished work on a variety he is calling New Hampshire No. 50 until a good name is found. This indeterminate variety is later ripening than High C, but superior in other respects. Along with increased size, its Vitamin C content approaches three times normal.

Yeager predicts that such tomatoes, as they are developed and become better known, will become standard varieties within ten years. Along with such serious work, however, he finds time for novelties. One originated in a project undertaken by a class in plant breeding. The idea was to see how small a tomato plant could be produced that would mature fruit. A cross was made between Windowbox and Red Currant. The resulting plants were then selected for determinate growth, dwarfness, smallness of fruit.

This variety produces cherry-sized tomatoes nicely while growing in a three-and one-half-inch flower pot. Yeager does not like to have an unusual variety go to waste. He had already seen his Carnival and Popinjay varieties of popcorn become popular because their gaily colored kernels serve as holiday decorations. Looking at the new tomato, he wondered if it might not have value as an ornamental for Christmas decorations. This time, he had no difficulty thinking up a name. It is called Tiny Tim.

SUN'S NEAREST NEIGHBORS

(Continued from page 212)

April is a month in which there will be much of interest to observe in the heavens. Both Mercury and Venus will be at greatest elongation, or greatest angular distance from the sun, in April. Mercury will be in the evening sky and Venus in the morning sky. This will be the most favorable time of the year to look for Mercury in the western evening sky. It will be at greatest eastern elongation on April 22, but should be seen without difficulty for more than a week before and after this date. The planet will be only a few degrees southwest of the Pleiades, and northwest of Aldebaran and The Hyades in Taurus, the latter part of April. As the planet is, at the time of greatest elongation, as brilliant as Capella or Vega, and more brilliant than Aldebaran, it should be found easily in the evening twilight. Venus will reach its greatest angular distance west of the sun in the early morning of April 11. It is now exceptionally brilliant, although even when least brilliant it far outshines all other planets. It will be a magnificent Morning Star throughout the month, and will remain a brilliant object in the morning sky until September. If viewed through the telescope at the time of their greatest elongations, both Mercury and Venus will exhibit the phase of the half-moon. Venus will be in conjunction with Jupiter on April 5 and the two brilliant planets then will make a beautiful pair. Venus will be about two degrees north of Jupiter. The giant planet is now in the constellation of Aquarius and rises in the southeast about two hours before the sun.

Mars is still at nearly its maximum brightness. It is well above the eastern horizon at sunset and by far the most brilliant stellar object in its part of the heavens. It is in Virgo at this time, between Spica and Saturn. The latter planet, yellowish in color, is now noticeably brighter than Spica and Regulus. It will be found nearly midway between Regulus and Mars. Both Mars and Saturn will be visible most of the night.

On April 2 there will be a total eclipse of the moon. This will not be visible in North America.

April is the month when the meteoric shower known as The Lyrids may be seen between April 20 and 22, after midnight. They average about ten an hour and appear from the general direction of Lyra as swiftly darting streaks of light, bluish in color.

Fishing Licenses Up

A new high was established when the fishing license sales for the fiscal year ending June 30, 1949 were totalled. For that year 15,478,570 such licenses were sold in the 48 States. Michigan again headed the list with 1,110,109. Gross revenue from this sale was $32,657,940, also a new high.

Gadgets

Under the brand name, "T.P.A.Naplasco," the National Plastic Company, 2591 East Foothill Blvd., Pasadena 8, California, offers a compact, folding, transparent plastic fishing leader kit. It is designed by and for fishermen and is devised so that it can be carried easily and be handy whenever needed. Price is one dollar. . . Specialized Products Co., Port Washington, Wisconsin, produces an arrangement that should contribute to the solution of packing problems for travel by automobile. This is called the Hartal Auto Clothes-Rack that looks in the picture like a clever device that overcomes the various objections against current gadgets from which clothes may be suspended in traveling. . . The Seewhy Merchandise Company, Box 177-H Rondout Station, Kingston, N. Y., comes up with an adjunct to a pair of work shoes that makes same into a high shoe. This is called the "Zip-Cuf," and certainly allows one to change shoes for different purposes in the outdoors without actually doing so.

Young Scientists

From K-H Bischoff, publisher of *Der junge Forscher*, a popular scientific periodical edited by young men, comes word that he wishes to get in touch with scientists and students in other nations to the end that his publication may bring out articles by foreign scientists. He feels that through such united service to science international understanding may be built between young scientists. The address is 23 Spieka, Haus Lowecke, British Zone, Germany.

Nature Monoculars

Designed particularly for use in the field, two new prism monoculars have been developed and announced by the Wollensak Optical Company. They are available both in 6-power and 8-power magnification. Designers have given major attention to compactness and lightness for outdoor use. The glass is easy to focus with one hand and gives a wide field of view. All optical surfaces are Wooted, assuring clear, bright image, and a clearly marked diopter scale is engraved on the eyepiece for individual setting.

Forest Mensuration

Forest Mensuration. By Herman H. Chapman and Walter H. Meyer. New York. 1949. McGraw-Hill Book Company. 522 pages. $5.00.

This forestry textbook supersedes *Elements of Forest Mensuration* by Chapman and Demeritt. It approaches the subject economically, dealing first with uses and products as a basis for all other steps in mensuration. The earlier volume has been completely rewritten, rearranged and extended to include new techniques.

CHESTNUTS ON THE COME BACK TRAIL

(Continued from page 183)

has also been made by Dr. J. Russell Smith, noted author of books on food trees and economic geography. Dr. Smith lives in Swarthmore, Pennsylvania, where he teaches at the famous Friends' college. But he also has a nursery and experimental farm in the Blue Ridge Mountains of northern Virginia. There he breeds, tests and propagates chestnuts and other food trees, including pecans, English and black walnuts, oriental persimmons, and pawpaws. His nursery is at a high altitude, 800 to 1400 feet, where the snow sometimes lies two feet or more deep and the temperature goes to 10 degrees below zero. Since he uses only northern-grown strains of chestnuts he feels that his trees are hardy enough, except in the farthest north of the states. He advocates grafted trees since they come true, whereas seedlings vary in quality and hardiness. He has had grafted trees bear nuts the third year, and he asserts that the chestnut is the most precocious and productive nut tree known to the Temperate Zone.

In addition to the varieties released by the U.S.D.A. — namely the Nanking, Kuling and Meiling — Dr. Smith also has the Connecticut Yankee and the Abundance, which he has not yet released, but both of which he feels are really superior. In a recent letter he strongly advises against taking chances on seedling trees or others of unknown origin. The Japanese chestnut, for instance, he feels is too inferior to be worth planting in this country, although the nuts are large. Even the Chinese strains vary greatly in characteristics, but the best of them, such as the Zimmerman, are absolutely blight resistant. It is well that we have enthusiasts of Smith's character and integrity, who are willing to pioneer in this interesting and important field of plant research.

Another plant that is closely related to the American chestnut is the chinquapin. This has about the same range as the chestnut, from Pennsylvania southward and into Texas. It is usually a large bush rather than a tree, although the trunk grows to some size in southwestern states. It has a spreading habit and the nuts are borne singly instead of three or more to a bur, as in the chestnut. The nuts are sweet and of good quality. There is a Chinese species of this, also, that is being used by the U. S. Department of Agriculture in its search for parents that will be immune to the blight and that will also produce timber trees as well as food for wildlife. No stone, or rather chestnut, is being left unturned in the search for new strains or varieties that will be a worthy substitute for the almost extinct American chestnut. But for the home grounds it is important in planting chestnuts to get a good strain. Also they should be planted in pairs or groups to insure fertilization.

Conservation Essays

Part of the program of a bird conservation project carried out cooperatively between the Klamath County (Oregon) School District, the Klamath Modoc Chapter of the Izaak Walton League and the Nature Society of the Klamath Region was an essay contest. A fine response was received. Space does not permit reproducing all of the prize winning essays, but the following took prizes:

FEED YOUR FRIENDS

By William Lawrence
Grade 6, Henley School

Do you remember the winter of 48-49? The snow drifted as high as my head in our pasture, but I scooped a place bare under a juniper tree, that had low branches and made a nice shelter for bird friends. I used my sled and took sack after sack of grain to feed them. We saved the screenings after the grain was cleaned. It had barley and wheat as well as many other seeds in it. I took it every few days and carefully placed this feed so the birds could get it and still not scatter the seeds around.

There were lots of pheasants, quail, robins, ducks, geese, and pigeons, and even rabbits that liked my bird restaurant. As long as birds came to eat they found food.

Last summer the quail stayed in our garden eating bugs, and we fed them with the banties. They would come up on the porch and eat bread crumbs. There were between forty and fifty of them. Our feathered friends stayed with us until some men came from town and without our permission shot nearly all of them.

I missed our little bird friends but perhaps I will have another chance to make some new friends if our winter is like last year's.

CARING FOR THE BIRDS

By Joan Taylor
Grade 4, Henley School

Having a place for birds in your own backyard is simple. It should be built so the birds are safe from four-footed animals. It is nice to have a water pan or fountain that would be easily thawed in the winter time so the birds would have fresh water daily.

You put feed out for them in plates or on boards in a nice open place. You may use bread crumbs, bird seed, suet, cracked grain, chicken scratch, pie crust, raisins, and anything that can be ground, such as sunflower seeds, pumpkin seeds, or any other dry seeds you may have that can be eaten. The birds also need some grit or ashes to help digest this food. In the country sometimes where there are grain hay stacks birds will rustle their own feed from them.

You could have a round or square feeding station. Now to build the round feeding station, take one or two boards and make one side round then take another board and do the same. Then nail the boards together. Also be sure they are about two or three feet wide and long. Now to build the square feeding station take about three or four boards about two feet long and one foot wide on each one. Then nail the boards together. Then you have two kinds of feeding stations. Also you can make different kinds, sizes, and shapes. Then be sure the feeding stations are about three or four feet off the ground so that cats or other animals could not climb the tree and eat up the food that you put out there for the birds to eat.

Some birds will bathe in a shallow pan of water fountains and irrigation ditches and many other places.

We need the birds so we should be kind to them as they eat lots of bugs, worms, and insects that destroy our gardens and crops.

To Mr. Baxter

Inspired by the "letter to God" from John Baxter, published in our January, 1950, issue, Bertha P. Hill of Bakersfield, California, writes a letter to Mr. Baxter. She says that she has read his letter thoughtfully and reverently, and wishes that it might be widely circulated. Addressing Mr. Baxter, then, she says:

"The *Book* is a great story of human experience and all that pertains to it; and I am sure that it contains a clear refutation of the dictum of the professed teacher concerning your dog.

"In *Isaiah* 11, verses 6 to 9, is set forth in simple words something of what constitutes the millennium (commonly called heaven), wherein shall dwell together in peace and harmony the wolf and the lamb, the leopard and the kid, and the cow and the bear; and a little child shall be safe among them.

"It does not place any strain upon one's thinking to see that in the wide range of animals mentioned, and between the extremes of their characteristics, must be included all the others that we know.

"I think you can feel assured, Mr. Baxter, that the God who is implied in the verses mentioned will not laugh at your prayer."

New York Conservation

From Walter Elwood, chairman of the conservation committee of the Federation of New York State Bird Clubs, comes an appeal to cooperate with the Conservation Forum of Western New York in support of three conservation issues. One seeks the protection in New York of wood ducks, marsh hawks and snowy owls, occasional visitors. Second is legislation banning traffic in ground pines and club mosses so devastatingly gathered for Christmas use. Third is repeal of amendments to the law under which exploitation of the Forest Preserve for private gain is possible. Panther Dam is an example of this last threat.

Graduates in Conservation

Yale University has joined with the Conservation Foundation in establishing a graduate program of research and instruction in conservation of natural resources. The courses will begin in September, 1950, under Paul B. Sears, who will be Professor of Conservation, a newly created post. The graduate course will lead to the degree of Master of Science in Conservation and require two years of study and research. Professor Sears leaves the staff of Oberlin College to join the Yale faculty.

Minnesota Bird

Although the goldfinch has been listed as the State Bird of Minnesota it has never had official status and been recognized by legislative act. The 1949 Legislature, however, created a State Bird Commission, of which W. J. Breckenridge, Director, Minnesota Museum of Natural History, is chairman. Its aim is to facilitate the selection of an official avian emblem. This spring Minnesota's school children will ballot in a state-wide referendum on this subject, and, it is hoped, the 1951 Legislature will carry the results of the vote into effect. It is plain that there will be a lot of bird study in Minnesota schools this spring, and this campaign should be beneficial even beyond the selection of a State Bird.

Film Index

"An International Index of Films on the Conservation and Utilization of Resources" is the title of a 175-page bulletin compiled by UNESCO for the recent international conference held at Lake Success, New York. The films are briefly described and the conditions under which they may be obtained indicated. Information about this bulletin may be obtained from UNESCO at Lake Success.

Races of Man

This is Race. Edited by Earl W. Count. New York. 1950. Henry Schuman, Inc. 747 pages. $7.50.

This is a monumental anthology from international literature dealing with the races of man. "Race" is a much abused word, but an honorable one, nevertheless. Dr. Count of Hamilton College, in undertaking this selection, is concerned with the scientific concept of the races of man. Attitudes on race are not within his scope, but an understanding of races — if we could all achieve it — should be a controlling factor in these attitudes. The editor is a cultural and physical anthropologist. He has drawn upon sixty sources for this anthology and on material originally published in one of nine different languages. Some of the writings are here rendered into English for the first time, and, indeed, this volume is the first of its kind, probably in any tongue and certainly in English.

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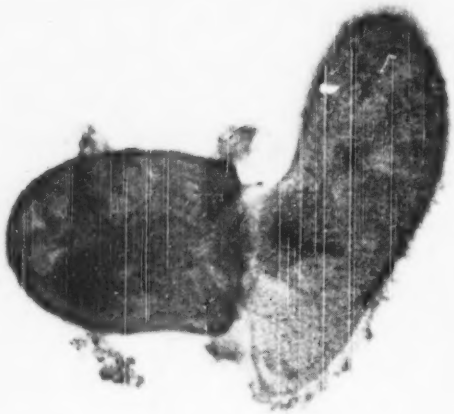
Under the Microscope

By JULIAN D. CORRINGTON

Introduction to Paramecium

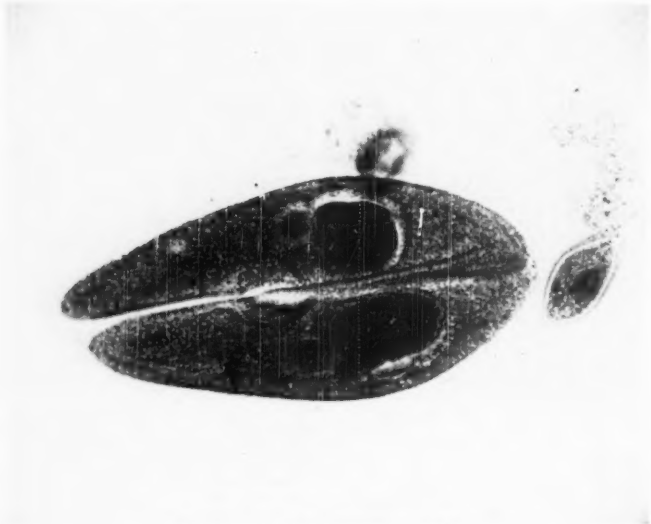
FIFTY years ago, when our now mature Century was an infant, the vogue in American zoological circles was to employ the sometimes pedantic and often stilted British names for unfamiliar animals. Thus, paramecium was the "slipper animalcule," vorticella the "bell animalcule," amphioxus the "lancelet," while another of our lowly relatives bore the awkward so briquet of "acorn-tongued worm." The belief prevailed that such so-called "common" names were essential since the lay public would never accept the supposedly formidable scientific names. This, too, in face of the fact that botanists and horticulturalists had succeeded with the opposite policy. The society matron, without thought that the monikers she reels off are Latin, converses glibly about her delphiniums, azaleas, hydrangeas, etc., etc., and comes to regard such designations as nothing out of the ordinary.

Fortunately, readers of adult literature now include a large proportion of men and women who, in high school or college, have been exposed to at least a beginning course in biology or zoology, and who understand what is meant by an amœba, a hydra, or a planaria. The scientific name of the genus, anglicized and in lower case, thus becomes the acceptable common name — often no more "foreign" or abstruse than the English equivalent, should there be one. Even the uneducated man speaks of a boa constrictor, although he would laugh at the idea that he was talking Latin and using the full scientific name, written *Boa constrictor* when used technically.



Didinium, the Paramecium Tiger, devouring its prey. 550X.

Our present subject may, then, be termed paramecium, with the English plural parameciums; or, we may designate a particular species in the regulation professional manner, such as *Paramecium caudatum*, or use the Latin plural, paramecia, if we wish. The word means "oblong" and indicates one of some ten species of single-celled and microscopic animals, of the Phylum Protozoa, Class Ciliata or Infusoria, protozoans that progress by means of cilia. These structures (singular, *cilium*, L., eyelash) are fine, hair-like protrusions that beat rhythmically and propel the animal forward or backward with equal facility. Paramecium belongs to the Order Holotrichida (entirely-hairy) with simple cilia of approximately equal size distributed more or less uniformly over the whole body, as in *Paramecium*, or confined to certain zones, as in *Didinium* (illustrated) with two or more girdles of cilia. Commonly, the many species in this order are referred to as holotrichs. By contrast, members of other orders have restricted and enlarged cilia, usually fused and modified into membranelles and cirri.



Conjugation in Paramecium, 550X.

As compared with other holotrichs, the genus *Paramecium* has the *peristome* (around-mouth) in the form of an *oral groove*, a deep, scooped-out depression or trough that begins at the anterior end of the cell and spirals backward toward the right — clockwise when the animal is viewed head on — to a point a bit beyond the middle, there terminating in the *cytostome* (cell-mouth) which leads into the *cytopharynx* or gullet. Hyman groups the species of paramecia into two types (named after two of the better-known species) on a basis of shape. The *aurelia* type has the outline of a slipper, the heel making the anterior end of the animal, the broadest part slightly behind the middle, the pointed toe forming the posterior; and the *bursaria* type, somewhat flattened, the body of uniform width except the pointed anterior end, which curves to the right. Hegner divided the eight species then known into the *caudatum* and *bursaria* groups according to arrangement of

Pellicle stain, Paramecium showing surface sculpturing, 330X

the ventral cilia.

Paramecia have been studied with extraordinary intensity by an imposing array of specialized talent for many years. Doubtless every possible biological principle has been tested with this protozoan as the material. Some investigators have been chiefly concerned with exhaustive details of their structure and physiology; others with the cytology of their reproduction; still others with their behavior, speciation, distribution, or with population studies, heredity and evolution.

As is generally true of other subjects, it is entirely possible to give what at the time seems a fairly complete study of paramecium in the high school biology class, then again at the freshman college level, thirdly in the advanced invertebrate zoology course, and fourthly in the senior or graduate course in protozoology. Each time the student feels he has mastered the subject, yet finds just as many new worlds to conquer when the same old animal appears in the next higher presentation. Finally, after he is certain he has squeezed every atom of information out of this Lilliputian creature, he discovers that he is now ready to start all over again at the graduate level and really begin to learn something about paramecia by conducting original studies of his own. Many prominent zoologists have devoted their lifetimes to some phase of the many-sided nature of these amazing animals.

Among the most fruitful concepts that have grown out of these researches is the overthrow of the old idea of the *simplicity* of the protozoa. Inasmuch as the whole animal is a single cell, it was formerly thought, and is still more or less implied in today's teaching, that any protozoan is extremely simple as compared with even the lowliest of many-celled organisms, with their differentiation of cells into tissues, each of which is specialized to perform only certain tasks. It is true that an amœba, although not the simplest of protozoans, is a relatively unmodified blob of protoplasm (those doing advanced work on amœbas would dispute this) but the case is very different with the ciliates. Paramecium is only about half way up the ladder of extreme specialization met with in this larger group, yet it takes but little study of this cell to realize that it is far more complex than any cell in the human body. And the higher ciliates make even paramecium seem a mere beginner in demonstrating how really complicated a cell can become.

The ciliates are an end line of evolution and have given rise only to more and more complexly organized unicellular animals. They are not in any way ancestral to higher animals but, instead, form a parallel series. As to whether a paramecium is "higher" or "lower" than some metazoan animal, as a sponge, a hydra, a worm, or a man — this depends upon one's definition of these terms. Certainly the ciliates are highest of all from the standpoint of intricate detail of mechanism and of behavior within the limitations of a single cell. Accordingly, there has been developed the notion that we should regard them as non-cellular (acellular) rather than unicellular — the formation of an elaborate body with many complex organs without the procedure of evolving colonies of distinctive cells.

Because an organ, by definition, is composed of tissues, which in turn are made of cells, application of the term to structures in the protozoa seemed inappropriate and hence the word *organelle* was devised to indicate such modified bits of protoplasm as a contractile vacuole or membranelle. Likewise, a still more recent usage has tended to emphasize the functional analogy between organs and organelles by the use of cytostome for mouth-spot, cytopharynx for gullet, cytopyge for anal spot, and so on. Paramecium, then, is a complex creature indeed, and the microscopist can spend from few to hundreds of hours on this fascinating subject without danger of boredom.

Instead of following our usual procedure of taking up in each issue a single subject, as completely as space limitations permit, we are going to try a different approach with paramecium. We shall sign off for this time with a general anatomical survey, then take up numerous special topics and studies in succeeding numbers; items of a nature to stimulate interest in the protozoa in general and paramecium in particular. There will be the simpler sort of discussion for the beginner, notes for the teacher, and suggestions for advanced work. Some of these installments will deal with collecting and culturing, others with methods of observation and experimentation.

Paramecium exhibits a constant shape, unlike the ever-changing amœba, due to the presence of a relatively tough *pellicle* (cuticle, periplast) as an external covering. There is a comparatively thin and clear *ectoplasm* (ectosarc), the outer portion of the cell cytoplasm, and a very granular central *entoplasm* (endoplasm, ento- or endosarc). As in all save a few ciliates, the work of the nucleus is subdivided: there is a large vegetative *macronucleus* and one to several small reproductive *micronuclei*. Reproduction may be asexual, by transverse fission, or sexual by conjugation.

In the commonly studied *P. caudatum* or *P. aurelia* there are two *contractile vacuoles*, one in the forward half, the other in the rear half. They do not work alternately, as has been supposed, but the rear vacuole, being nearest the intake of water through the cytopharynx, pulsates at a higher rate than the front vacuole. Excretions and water are collected by a set of *radiating canals*, six to ten in number, for each vacuole. When swollen full these contract simultaneously, forcing their contents toward a common central point, which is the vacuole, and this then eliminates through a pore that is probably permanent.

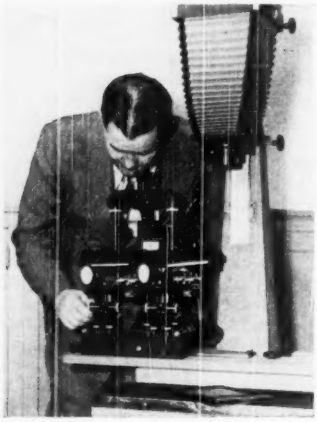
Food vacuoles are formed at the bottom of the cytopharynx and consist each of a globule of water containing the food organisms, which are mainly bacteria. Contrary to statements met with in almost every text, paramecium does not have an *undulating membrane* in its gullet (Gelei, 1934) but bands of specialized cilia whose beating, under all ordinary observations, resembles those of undulating membranes. These cilia drive food particles into the end of the gullet and, when the forming vacuole has reached a certain size, the surrounding entoplasm contracts and pinches it off, an action analogous to swallowing. The food vacuole then is carried to the rear, circles slowly around to the dorsal side and thence forward, finally back along the ventral (oral) surface, passing the cytopharynx and emptying its undigested residue through the *cytopyge*, a permanent anal pore located near or in rear of the cytopharynx, and not visible except at the moment of discharge. During this transit of the vacuoles, known as *cyclosis*, performing a function for the animal equivalent to circulation as far as nutrition is concerned, the food is being digested and absorbed, the vacuoles continually decreasing in size.

Our hero is preyed upon by many other organisms, but its chief terror is *Didinium*, the Paramecium Tiger (illustrated). This ciliate has a proboscis by means of which it adheres to any paramecium against which it may blunder. The mouth, at the tip of the proboscis, then opens to a great width, the proboscis retracts, and the hapless victim is drawn into the didinium. This tiger of the microcosm can engulf other ciliates much larger than itself.

When thus attacked, a paramecium puts forth many *trichocysts*. These structures, before use, lie in a layer of the ectoplasm sometimes called the *cortex*, and occur all over the cell. They are packed closely in a single row, standing vertically to the surface; each is black in color and resembles a carrot in shape. The mechanism of discharge is not known. After emission the oval structure becomes a long fine thread and, if the attacker is small and enough trichocysts explode, the didinium may be mechanically forced away.

Often, however, the paramecium is devoured in spite of these trichocysts, and some investigators hold that the function of these threads is not to repel enemies but to attach the paramecium to some object in its environment while it is feeding on bacteria.

Even with this barest of introductions to the anatomy of paramecium, it becomes clear that long ages of changes have done a very creditable job of complicating and elaborating the parts of a single cell. To how great an extent this is true will become more apparent in future additions to our paramecium series.



FAMILY ALBUM

3. The Bullet Comparison Microscope

THE black sheep of the microscope family are a pair of conjoined twins who hobnob with a sinister assortment of underworld characters. One day they may be seen trafficking with specimens of human hair, perhaps one batch taken from the clutch of the latest corpse, the other, for comparison, removed tonsorially from the as yet living head of the suspect! Again, the twins consort with tool marks, fingerprints, and other questionable jobs. But, by and large, their favorites are slugs — bullets to you.

Now, be it known, as a matter of elementary ballistics, that if any projectile having a long axis, such as an arrow or bullet, is to pursue its trajectory accurately, it must be given a rotary motion to prevent tumbling end on end or lobbing sidewise. Hence an arrow is feathered, each fin being a portion of a spiral, and a bullet is given a longitudinal spin by the rifling of the barrel, be it cannon, rifle, or revolver. Spiral *grooves* are cut into the bore of the rifle, the level surfaces between grooves being the *lands*. Various makes and models of gun barrels differ in number, width, and pitch of the grooves and lands, and this rifling imparts markings or scratches to the surface of the bullet as it whirls through the barrel. No two guns will have exactly the same disposition of these features and the markings imparted to bullets fired through a particular weapon are as distinctive as fingerprints. Precision in bullet identification is one of the major achievements of scientific crime detection.

The *modus operandi* in this work is to compare an unknown with a known; to inspect, under magnification, the minute details of scratches on a bullet recovered from the body of a homicide victim, for example, with a similar bullet fired from the gun found in possession of a suspect. Discharging this second bullet into a bale of sphagnum moss is one of a number of ways of obtaining a specimen in undeformed condition. The two missiles can be observed separately, in which case the scratches would have to be memorized or drawn, a slipshod procedure of little value here. They can be photographed and the two prints studied side by side; but unless they both show exactly the same arc of circumference, an accurate contrast is not possible.

The *comparison microscope* provides just the means this case requires. Like the human twin monster known as a syncephalus, with two bodies and only a single head, this member of the microscope family is duplex throughout except for the single eyepiece. The human counterpart is kept in bottles on museum shelves, while the mechanical twin lurks in police and sheriff's laboratories.

Our illustration shows Inspector William A. Winfield, head of the Police Identification Bureau at Rochester, New York, operating the new Bausch & Lomb bullet comparison microscope. Beginning at the bottom of the picture, one notes the instrument's optical bed, a heavy casting on which all parts are mounted. It is fastened to a sliding baseboard moving horizontally on steel rods. The position shown is for visual inspection; movement to the right would bring the apparatus beneath the photomicrographic camera, a cushioned stop aligning the eyepiece of the microscope with the optical axis of the camera, which is lowered into a light-tight connection for making exposures.

Next above come twin stands, somewhat resembling dissecting microscopes. The Inspector, a past president of the International Association for Identification, is operating an adjustment that raises or lowers the entire instrument on his right, so as to secure a precise focus of one of the two bullets being examined and compared. Mechanical stages permit full movement in both horizontal dimensions. Each stage is illuminated separately. The round white object directly above the Inspector's thumb is a mirror mounted above-stage so as to aid in securing a uniform lighting of both specimens. Above and behind the lamps the microscope tubes may be seen. They lead to a horizontal housing containing prisms so that images from both tubes are directed into a single eyepiece. Here the observer sees the left half of the specimen under the left tube aligned with the right half of a similar specimen under the right tube.

Situated above each stage and toward the operator is the bullet-holding mechanism, a chuck that is rotated so as to display any desired surface of the object. By means of six adjustments — right-left and forward-rear with the mechanical stage buttons, up-down with the two stage focusing knobs, rotation of the two bullets in their chucks, lamp housings, and mirrors — the two half-images in the single eyepiece may be perfectly aligned and uniformly illuminated. If the two bullets were fired from the same gun, the rifling marks can be matched up precisely; if from different guns, even though of the same caliber, make, and model, the scratches will not be identical and the two half-images cannot be blended into a single uniform picture.

When the perfect fusion image is obtained, the apparatus is moved into position under the camera, exposures are made, and the subsequent prints enlarged so as to provide the kind of scientific evidence that carries conviction to judge and jury and, more often than formerly, to the prisoner.

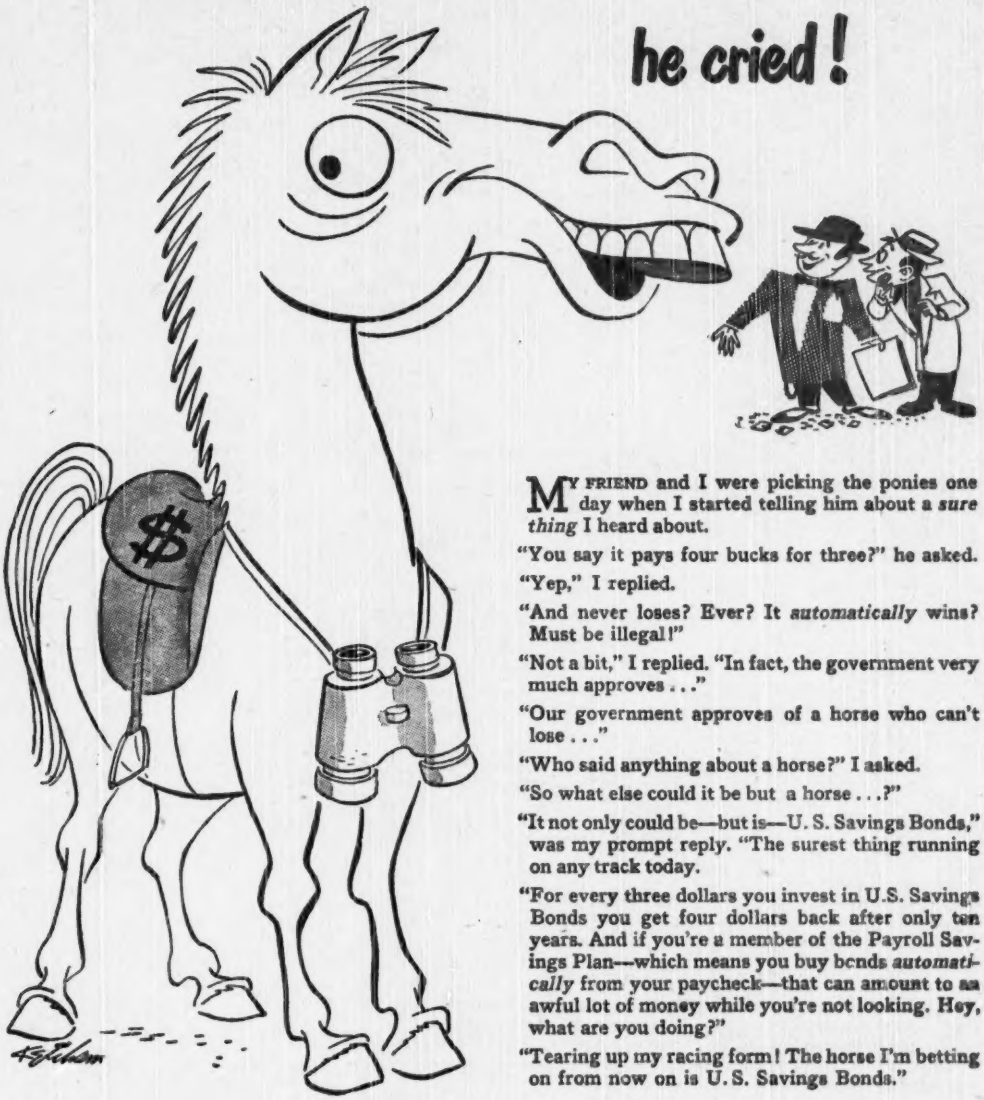
EVOLUTION

THE revised edition of Lull's *Organic Evolution* is a new issue of a work that is well known wherever English is spoken. The Sterling Professor of Paleontology and Director of the Peabody Museum, Emeritus, at Yale, Richard Swann Lull, has lived with and directed one of the world's most celebrated collections to demonstrate evolution and his authority in this field is preeminent.

Part I, Introduction, deals with the history of evolution, classification of organisms, and their distribution in both space and time. Part II, The Mechanism of Evolution, embodies critical discussions of variation, heredity, selection, environmentalism, and the several theories on the course of Evolution. Part III takes up the detailed proofs for evolution, the larger half of this being paleontological.

The treatment is almost wholly morphological:— we looked in vain for chemical evidences, as precipitin tests, or the coevolution of parasites and hosts. However, this morphological knowledge is the backbone of modern biology, and absolutely essential information for those who would claim to be educated along scientific lines. Professor Lull has a vivid and interesting way of presenting facts or discussing theories, and the layman as well as the student can read this work profitably. The many illustrations aid greatly, especially the excellent plates, gathered together in a single clip in the center of the book. The 44-page index is a further important help in using the volume. Pp. xx, 744; plts. XXXI, figs. 265. The Macmillan Co., 60 Fifth Ave., N. Y. 11, 1947. $6.75.

"There's no such animal," he cried!



MY FRIEND and I were picking the ponies one day when I started telling him about a *sure thing* I heard about.

"You say it pays four bucks for three?" he asked.

"Yep," I replied.

"And never loses? Ever? It *automatically* wins? Must be illegal!"

"Not a bit," I replied. "In fact, the government very much approves . . ."

"Our government approves of a horse who can't lose . . ."

"Who said anything about a horse?" I asked.

"So what else could it be but a horse . . .?"

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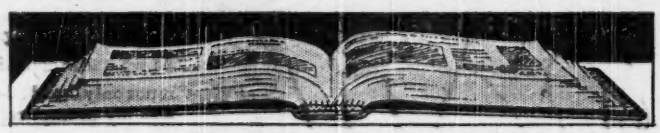

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